



**NAVAL FACILITIES ENGINEERING SERVICE
CENTER**

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WATERFRONT FACILITIES

MOORING CONDITION REPORT

**NORFOLK NAVAL
SHIPYARD**

PORTSMOUTH, VIRGINIA

CR-6119-OCN

by

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Prepared for

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NORFOLK NAVAL SHIPYARD

PORTSMOUTH, VIRGINIA

EXECUTIVE SUMMARY

An inspection of mooring hardware on marine waterfront facilities at Norfolk Naval Shipyard in Portsmouth, Virginia was conducted from June 1, 1998 through June 5, 1998 and on August 3, 1998 through August 5, 1998. The following report covers the condition and location of mooring hardware. in a clear, concise, color-coded, visual format. The data provided in this report should be used in conjunction with other site specific information, as a reference for determining safe mooring configurations during heavy weather conditions.

In general, the condition of the mooring hardware at the Norfolk Naval Shipyard in Portsmouth, Virginia is found to be in good to excellent condition. There is localized damage or deterioration noted throughout the shipyard, but these conditions do not adversely effect any facilities berthing/mooring capability. Facility users should take appropriate action to repair or remove damaged mooring hardware and account for such actions as necessary in developing berthing plans. All hardware with #3 or #4 condition ratings are listed in the following condition summary table.

Determination of allowable mooring loads on pier structures within this report is based on assumed data. Additional investigation would be required, in order to structurally rate the pier facilities for mooring loads. The assumptions made are based on sound engineering practices and provide facility users with baseline information. If critical berthing situations arise, additional facility specific investigation will be required to determine allowable loading.




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NORFOLK NAVAL SHIPYARD

MOORING CONDITION REPORT

MARGINAL AND CRITICAL FITTING SUMMARY TABLE

BERTH	FITTING #	TYPE OF FITTING	LOAD CONDITION	
			FITTING	BASE
BERTH 2	B2-C2	26"CLEAT	3	
	B2-C3	26" CLEAT	3	
	B2-C8	26" CLEAT		3
	B2-B4	SINGLE BIT	4	
BERTH 6	WS1-C29	42" CLEAT		3
	WS1-B8	BOLLARD		3
BERTH 7	B7-B1	BOLLARD		3
	B7-C4	26' CLEAT	4	3
BERTH 8	B7-C17	26" CLEAT	4	4
	B7-C18	26" CLEAT	4	4
FERRY SLIP	FS-C2	26" CLEAT		4
	FS-C3	26" CLEAT		3
	FS-C4	26" CLEAT		3
BERTH 9	B9-C1	42" CLEAT		3
	B9-C2	42" CLEAT		4
	B9-C3	26" CLEAT		3
	B9-C4	42" CLEAT		3
	B9-C6	26" CLEAT		4
	B9-C7	26" CLEAT		3
	B9-C11	26" CLEAT		3
BERTH 10	B10-C10	26" CLEAT		3
BERTH 11	B11-C2	26" CLEAT	4	4
BERTH 14	B14-C3	42"CLEAT		3
	B14-C4	42"CLEAT		3
BERTH 15	B14-C8	42"CLEAT		3
BERTH 16	B16-C1	26"CLEAT		4
BARGE BASIN	BB-C4	26"CLEAT	4	
BERTH 32	B32-C1	42"CLEAT	4	
BERTH 33	B32-C11	42"CLEAT	4	

BERTH 36	B35-C19	42"CLEAT		3
DRY DOCK 1	DD1P-B1	12"DIA PIPE	4	
	DD1P-CP3	WINDLASS	3	
DRY DOCK 2	DD2S-C6	42"CLEAT	3	
	DD2S-B1	CANNON	3	4
	DD2S-C7	42"CLEAT	3	
	DD2S-C10	42"CLEAT	3	
	DD2S-C11	42"CLEAT	3	
	DD2P-C7	42"CLEAT	4	4
	DD2P-C10	42"CLEAT	4	4
	DD2P-C12	42"CLEAT	3	3
	DD2P-C12	42"CLEAT	3	3
	DD2P-C13	42"CLEAT	3	3
DRY DOCK 3	DD3S-C8	42"CLEAT	3	3
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DRY DOCK 4	DD4P-B9	SHORT BOLLARD	3	
	DD4P-CP8	WINDLASS	3	
DRY DOCK 6	DD6S-C8	26"CLEAT	4	
	DD6S-C14	26"CLEAT	4	
	DD6P-C6	26"CLEAT		3
DRY DOCK 7	DD7P-C2	26"CLEAT		3

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1.0 INTRODUCTION

1.1 BACKGROUND/OBJECTIVES

The Underwater Inspection Program (UWIP) of the Naval Facilities Engineering Service Center (NFESC) provides for the underwater inspection and structural assessment of waterfront facilities and the design of the repairs for deficiencies discovered during the inspection. Provision is also made for the underwater inspection of completed repairs performed as a result of the findings of the initial inspection. The findings of the underwater inspection and structural assessment have traditionally been presented in a standardized engineering report format containing photographs and plans. As a supplement to the standard engineering report, this document will present the findings of a recently completed facility inspection in an alternate, concise, color-coded, visual format. The information will be presented as a condition report, which is intended to portray the essential findings of the inspection and their impact on the use of the structure in a succinct manner.

This work was performed under the direction of the Underwater Inspection Program conducted by the Ocean Construction Division, Naval Facilities Engineering Service Center, East Coast Detachment (NFESC-ECDDET Code 551) as a part of Naval Facilities Engineering Command's Specialized Inspection Program.

This program sponsors task-oriented engineering services for the inspection, structural analysis, repair recommendations, and estimates of repair costs for the inspected portions of naval waterfront facilities. This program provides inspection, structural analysis, repair recommendations, and estimates of repair costs for waterfront facilities. All of these services, including this report, were provided by Childs Engineering Corporation under the responsible charge of Craig D. Sams, P.E., in accordance with Delivery Order Nos. 11 and 12 of Contract N47408-96-D-4058. Funding was provided by Commander, Naval Surface Forces, Atlantic.

1.2 REPORT DESCRIPTION

The purpose of the mooring capacity report is to present a summarized structural assessment of a specific facility's ability to handle mooring line loads and berthing loads in a clear, concise, color-coded visual format. The mooring capacity report will address inspected areas of the facility using different colors to signify the degree of damage and urgency of repair. The following items will be included in the mooring capacity report

- Description of Facility
- Tables showing condition of mooring fixtures and approximate capacity of pier
- Representative photographs of individual fittings and fender systems
- Condition Plan indicating the condition rating of individual waterfront structures mooring fixtures and fender systems
- Pier model: A 3-dimensional model of each pier facility is generated in digital format for use in determining mooring line layouts using existing mooring fittings and fender systems

1.3 CONDITION RATING

The mooring capacity report presents the capacity of the facility to resist horizontal loading in a color-coded format. Different colors will be used on the accompanying plans to signify various levels of berthing and mooring capacity. Each mooring fitting and fender system will be depicted on the plan using the following colors:

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Green indicates areas in good operational condition



Blue indicates minor deterioration



Orange indicates moderate deterioration



Red indicates severe deterioration and loss of capacity

1.4 Digital Model

All berths at the Norfolk Naval shipyard have been rendered in three dimensions in an Autocad drawing using Autocad Release 14. Included in this drawing are accurate depictions of the structures, mooring fixtures, and fender system. Isometric as well as plan and section view can be taken from these drawings. Included in each section of this report is a rendered view of the berth. The intended use of this drawing is for digital manipulation within the computer environment to assist in the layout of berthing/mooring plans. The user can manipulate the drawing to plot cross-sections, plans, and isometric views.

2.0 ACTIVITY DESCRIPTION

2.1 LOCATION

The Norfolk Naval Shipyard, (NNSY) Portsmouth, Virginia is located adjacent to the South Branch of the Elizabeth River with access to its deep shipping channels and the Chesapeake Bay. The shipyard is located approximately 12 miles south of the Atlantic Fleet Headquarters, Naval Base, Norfolk.

The Norfolk Naval Shipyard is one of the largest naval shipyards in the world. There are seven dry docks, 30,000 lineal feet of berthing, and over 500 buildings and structures. These facilities all support the vessels of the Atlantic (6th) Fleet with ship repair and conversion capabilities. Refer to [FIG 2-1](#), [FIG 2-2](#), and [FIG 2-3](#) for vicinity and location maps.

2.2 EXISTING WATERFRONT FACILITIES

The waterfront facilities at the Norfolk Naval Shipyard provide an interface between the vessels and the shore support activities. The waterfront facilities inspected under this delivery order are shown on the location plan in [FIG 2-3](#).

The pier structures at NNSY were constructed at various times during the past 100 years. The oldest known structures were built around 1900 (Berths 4, 5, 9, 10, and 13). The newest structures were built in 1968 (Berths 16 and 17). The majority of the pier structures were built from 1900 to 1944. These facilities are predominately relieving platform structures supported by timber piles and faced with concrete sheet piles.

Photo 2-1 Area Overview:

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2.3 INSPECTION PROCEDURE

The inspection of mooring fittings was conducted via the topside deck surface. Visual observations of the condition of the fitting as well as the fitting base were made. A rating system was used to rate the fitting and its base on a scale of 1 to 4 with 1 being excellent and 4 being severely damaged. Load testing was not conducted as part of this investigation. The supporting pier structure was not inspected as part of this investigation. A cursory visual inspection of accessible components of some piers, i.e., blocking under some cleats, was conducted if possible.

The position of mooring fittings was determined by field measurements using a tape to measure offsets from the pier face and fitting elevations with respect to the pier deck surface. Stationing along the face of the pier was determined using a measuring wheel along the pier face. This data was coordinated with existing site data to produce the plan drawings.

The dry docks were stationed using alternate means. The centerline of the dry dock was stationed using the outer caisson seat as the origin. Offsets from the centerline were taken to identify position of the fitting or object in relation to the centerline stationing and offset distance. Each side of the dry dock was identified as either port or starboard, based on the normal docking position of ships in the dry dock (forward inshore, aft outshore).

2.4 FITTING NUMBERING SYSTEM

A numbering system was adopted to identify fittings along each pier face. The fittings are numbered consecutively following the stationing. The stationing begins at the northern most end of Berth 1 and runs continuously along each berthing face ending at Berth 43. The stationing has been reset to zero at each continuous berthing face. This means that the stationing may be continuous through two or more berths as the berth boundaries are not always readily discernible. Each fitting type has been designated as follows: B - Bollard; C - Cleat; BT - Bit. For example, fitting designations are written as follows:

B1 - C10

Where B1 = Berth 1

or

DD1P-C8 = Dry Dock #1, Portside – Cleat No. 8

C10 = Tenth cleat along berthing face (from Sta. 0+00)

In addition to fitting designations, a node number has been assigned to each fitting. The nodes are numbered consecutively along each berth. Fitting designation, node numbers, x, y, and z coordinates (local), fitting type and capacity and condition can be found in the data tables of each section. The local coordinate system is based on the X-axis running along the same line as the pier face and turning at each corner or curve. The Y-axis is perpendicular to the X-axis with the coordinate shown as the distance offset from the X-axis. The Z-axis is vertical and indicates the fitting elevation based on mean low water datum (0.0' = 92.48' station datum).



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3.1 INSPECTION OF BERTH 1

3.1.1 Description

Berth 1 was originally built in 1914 and was constructed with a reinforced concrete sheet pile bulkhead from Sta. 0+00 to Sta. 3+60. The bulkhead is tied back to a reinforced concrete deadman, which is set behind an existing timber wall. From Sta. 3+60 to Sta. 7+20 Berth 1 was constructed with a timber relieving platform supported by timber piles. The platform is faced with reinforced concrete sheet piling. The concrete sheet piling for Berth 1 has a concrete seawall that is backfilled with soil. The fill is covered with a concrete slab at the same elevation as the top of the concrete seawall. Berth 1 has approximately 700 LF of berthing.

The water depth at the face of Berth 1 varies from 24 feet to 30 feet from Mean Low Water (MLW).

The fender system at Berth 1 consists of timber piles with timber chocks and wale. The wale system is bolted directly to the top of the seawall. Sea cushions are used to fend off ships and provide some energy absorption.

3.1.2 Design Structural Capacity

<u>DESIGN STRUCTURAL CAPACITY SUMMARY TABLE</u>			
PIER FACILITY BERTHING AND MOORING ALLOWABLE LOADS *			
FACILITY	DESIGN RATINGS	CALCULATED CAPACITY	
		BERTHING	MOORING
BERTH 1	NONE FOUND	3.46 K/LF	1.42 K/LF
MOORING FIXTURE RATED AND CALCULATED ALLOWABLE LOADS *			
MOORING FIXTURE	QUANTITY	DESIGN RATINGS	CALCULATED RATING
BERTH 1			
42 " TYPE 3 CLEATS	7	20 TONS	N/A
26 " CLEATS	9	N/A	12 TONS
50 TON BOLLARDS	3	50 TONS @ HORIZONTAL 33 TONS @ 45 DEG.	N/A N/A
LOW DOUBLE BIT	2	61 TONS HORIZONTAL 37 TONS @ 45 DEG.	N/A N/A
SINGLE BIT	2	55 TONS HORIZONTAL	N/A
NOTES :			
* ALLOWABLE LOADS SHOWN ARE BASED ON ASSUMPTIONS . FOR ACTUAL LIVE LOAD LIMITS ADDITIONAL INVESTIGATION IS REQUIRED. SEE APPENDIX FOR COMPUTATIONS.			
N/A - NO INFORMATION AVAILABLE			

3.1.3 Existing Condition

Existing conditions of each mooring fixture are noted in Data Table No. 1 and in [FIG 3-1](#). The fixtures are rated based on a scale of 1 to 4 with one being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. On Berth 1 all fixtures are rated at 2 or higher and considered to be in good condition. There are no conditions which warrant downgrading of any fixtures' capacity at this time. It is noted that most fixtures need recoating. Examples of typical fixtures are shown on the photo page in this section. An example view of the 3D model may be found on [FIG 3-1A](#).



Photo 3.1-1, Berth 1, fitting B1-B1, Sta. 0+15.8, 50 ton bollard in good condition, #2 rating.



Photo 3.1-2, Berth 1, fitting B1-C2, Sta. 0+70, 42-inch type 3 cleat in good condition, #2 rating



Photo 3.1-3, Berth 1, fitting B1-BT1, Sta. 0+96, low double bitt in good condition, # 2 rating.



Photo 3.1-4, Berth 1, fitting B1-B2, Sta. 1+87.7, 50 ton bollard in good condition, #1 rating.



Photo 3.1-5, Berth 1, fitting B1-C12, Sta. 5+68, , 26-inch cleat in good condition, #2 rating.



Photo 3.1-6, Berth 1, fitting B1-B4, Sta. 6+17.2, single bitt in good condition, # 1 rating.



Photo 3.1-7, Berth 1, fitting B1-B15, Sta. 6+78, 26-inch cleat in good condition, # 2 rating.



Photo 3.1-8, Berth 1, Fender system in good operational condition, looking southeast.



NORFOLK NAVAL SHIPYARD

MOORING CONDITION REPORT

DATA TABLE NO. 1

BERTH No. 1								
FITTING #	NODE #	X	Y	Z	TYPE OF FITTING	LINE PULL *	CONDITION OF FITTING	
		COORD. (Ft)	COORD. (Ft)	COORD. (Ft)			FITTING	BASE
B1-B1	50101	15.8	1.8	7.67	BOLLARD	50	2	2
B1-C1	50102	40.2	2.25	11	42" CLEAT,TYPE 3	20	2	2
B1-C2	50103	70	2.25	11	42" CLEAT,TYPE 3	20	2	2
B1-BT1	50104	96	2.166	12.5	LOW DOUBLE BIT	61	2	2
B1-C3	50105	124.9	2.25	11	42" CLEAT,TYPE 3	20	1	2
B1-C4	50106	160.7	2.25	11	42" CLEAT,TYPE 3	20	2	1
B1-B2	50107	187.7	1.8	7.67	BOLLARD	50	1	1
B1-C5	50108	214.4	2.25	11	42" CLEAT,TYPE 3	20	1	1
B1-C6	50109	242.2	2.25	11	42" CLEAT,TYPE 3	20	2	2
B1-BT2	50110	268.6	2.166	12.5	LOW DOUBLE BIT	61	2	2
B1-C7	50111	314	1.58	11	42" CLEAT,TYPE 3	20	1	1
B1-B3	50112	341.4	2.75	12.67	BOLLARD	50	2	2
B1-C8	50113	370.5	3	11	26" CLEAT	12	1	1
B1-C9	50114	408.8	3	11	26" CLEAT	12	2	1
B1-C10	50115	476.5	3	11	26" CLEAT	12	1	1
B1-C11	50116	502.4	3	11	26" CLEAT	12	1	1
B1-C12	50117	568	3	11.17	26" CLEAT	12	2	1
B1-C13	50118	608.2	3	11.17	26" CLEAT	12	1	2
B1-B4	50119	617.2	1.66	10	SINGLE BIT	55	1	1
B1-C14	50120	641.4	3	11.17	26" CLEAT	12	2	1
B1-C15	50121	678	3	11.17	26" CLEAT	12	2	1
B1-B4	50122	705	1.66	10	SINGLE BIT	55	1	1
B1-C16	50123	713.9	3	11.17	26" CLEAT	12	1	1

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD



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3.2 INSPECTION OF BERTH NO. 2

3.2.1 Description

Berth No. 2 was originally built in 1914. The structure consists of timber pile supported relieving platforms with reinforced concrete sheet piles at the pier face. The relieving platform is filled with soil and the soil is retained by a reinforced concrete seawall at the face. There is approximately 800 LF of berthing at Berth 2. The water depth for Berth 2 ranges from 28 feet to 22 feet at the pier face. The fender system at Berth No. 2 consists of timber piles with timber chocks and wales. The wale system is bolted directly to the top of the seawall. Sea cushions are used to fend off ships and to provide energy absorption.

3.2.2 Design Structural Capacity

DESIGN STRUCTURAL CAPACITY SUMMARY TABLE			
PIER FACILITY BERTHING AND MOORING ALLOWABLE LOADS *			
FACILITY	DESIGN RATINGS	CALCULATED CAPACITY	
		BERTHING	MOORING
BERTH 2	NONE FOUND	3.46 K/LF	1.42 K/LF
MOORING FIXTURE RATED AND CALCULATED ALLOWABLE LOADS *			
MOORING FIXTURE	QUANTITY	DESIGN RATINGS	CALCULATED RATING
BERTH 2			
26 " CLEATS	24	N/A	12 TONS
50 TON BOLLARDS	1	50 TONS @HORIZONTAL 33 TONS @ 45 DEG.	N/A N/A
SINGLE BIT	5	55 TONS HORIZONTAL	N/A
NOTES:			
* ALLOWABLE LOADS SHOWN ARE BASED ON ASSUMPTIONS . FOR ACTUAL LIVE LOAD LIMITS ADDITIONAL INVESTIGATION IS REQUIRED. SEE APPENDIX FOR COMPUTATIONS.			
N/A - NO INFORMATION AVAILABLE			

3.2.3 Existing Condition

Existing conditions of each mooring fixture are noted on Data Table No. 2 and in [FIG 3-2](#). The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. On Berth No. 2 there are three fixtures that have a #3 rating, they are B2-C2, B2-C3, and B2-C8. For B2-C2 and B2-C3 these are 26-inch cleats which exhibit severe scaling and corrosion. For B2-C8 the #3 rating is based on a crack which is identified on the concrete seawall supporting the 26-inch cleat. Also, on Berth No. 2 there is one fitting, B2-B4, which has a #4 rating. This is the result of failure of the fitting with the top being broken off and missing. All other fixtures are rated at #2 or higher and are considered to be in good condition.

Fitting B2-B4 should be taken out of service and not used until it can be replaced in-kind. There are no other conditions which warrant downgrading of any fixture's capacity at this time. Examples of typical fixtures are shown on the photo page of this section. The data tables included in this section present detailed information on each fitting. The fender system at Berth 2 is in good operational condition.

An example view of the 3D model may be found on [FIG 3-2A](#).



Photo 3.2-1 Berth 2, fitting B2-C2, Sta. 0+48.8, 26-inch cleat exhibits scaling of coated surface, #3 rating



Photo 3.2-2 Berth 2, fitting B2-B1, Sta. 0+91.4 single bitt base is paved over, fitting in good condition, #1 rating



Photo 3.2-3 Berth 2, fitting B2-C13, Sta. 4+19.2 26-inch cleat in good condition, #1 rating



Photo 3.2-4 Berth 2 fitting B2-B4, Sta. 5+02.6, single bitt top has been sheared off, #4 rating



Photo 3.2-5 Berth 2, fitting B2-B6, Sta. 6+97.6, 50 ton bollard, base is paved over, fitting in good condition, #1 rating



Photo 3.2-6 Berth 2, Fender system overview



Photo 3.2-7 Berth 2, fitting B2-C3, Sta. 0+82, 26" cleat exhibits severe scaling and corrosion, #3 rating



Photo 3.2-8 Berth 2, fitting B2-C8, Sta. 2+48.6, 26" cleat base exhibits cracking, #3 rating

NORFOLK NAVAL SHIPYARD

MOORING CONDITION REPORT

DATA TABLE NO. 2-1

BERTH No. 2								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
B2-C1	50201	15.8	3	11.17	26" CLEAT	12	1	1
B2-C2	50202	48.8	1.66	7.67	26" CLEAT	12	3	1
B2-C3	50203	82	1.66	7.67	26" CLEAT	12	3	1
B2-B1	50204	91.4	14.25	9.67	SINGLE BIT	55	1	1
B2-C4	50205	115.8	1.66	7.67	26" CLEAT	12	1	1
B2-C5	50206	149	1.66	7.67	26" CLEAT	12	1	N/A
B2-C6	50207	192.6	1.66	7.67	26" CLEAT	12	2	1
B2-B2	50208	192.6	14.33	9.67	SINGLE BIT	55	1	N/A
B2-C7	50209	213.2	1.66	7.67	26" CLEAT	12	1	1
B2-C8	50210	248.6	1.66	7.67	26" CLEAT	12	2	3
B2-C9	50211	282.4	1.66	7.67	26" CLEAT	12	1	1
B2-C10	50212	312	3	11	26" CLEAT	12	2	1
B2-C11	50213	346.4	2.66	11	26" CLEAT	12	1	1
B2-C12	50214	382.3	2.66	11	26" CLEAT	12	1	1
B2-B3	50215	384	12	10	SINGLE BIT	55	1	1
B2-C13	50216	419.2	3	11	26" CLEAT	12	1	1
B2-C14	50217	451	3.33	11	26" CLEAT	12	2	1
B2-C15	50218	484	3.33	11	26" CLEAT	12	1	1
B2-B4	50219	502.6	13.75	9.17	SINGLE BIT	0	4	2
B2-C16	50220	513.2	3.33	11	26" CLEAT	12	2	2
B2-C17	50221	549.6	3.33	11	26" CLEAT	12	2	2
B2-C18	50222	583	3.33	11	26" CLEAT	12	2	1

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION, SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 2-2

BERTH No. 2 Cont.								
FITTING #	NODE #	X	Y	Z	TYPE OF FITTING	LINE PULL *	CONDITION OF FITTING	
		COORD. (Ft)	COORD. (Ft)	COORD. (Ft)			FITTING	BASE
B2-B5	50223	586	14	9.5	SINGLE BIT	55	1	1
B2-C19	50224	616.9	3.33	11	26" CLEAT	12	1	1
B2-C20	50225	650	3.33	11	26" CLEAT	12	1	1
B2-C21	50226	684	3.33	11	26" CLEAT	12	2	1
B2-B6	50227	697.6	13.66	9.17	BOLLARD	50	1	1
B2-C22	50228	717.6	3.33	11	26" CLEAT	12	1	1
B2-C23	50229	749.8	3.33	11	26" CLEAT	12	1	2
B2-C24	50230	777.7	3.33	11	26" CLEAT	12	2	1

CONDITION RATING KEY

1

1= EXCELLENT (NEW - NO DAMAGE)

2

2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3

3 = MARGINAL (SIGNIFICANT CORROSION, SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4

4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD



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3.3 INSPECTION OF BERTHS NO. 3, 4, 5, AND 6 (WET SLIP NO. 1)

3.3.1 Description

Berths 3 and 6 were originally built in 1944, while Berths 4 and 5 were built circa 1900. Berth 3 consists of a concrete cast-in-place open pier supported by precast concrete piles. This pile supported section has a steel sheet pile bulkhead on the north side where the pier adjoins the shore. The remainder of the berth is a concrete sheet pile faced relieving platform. Berths 4 and 5 consist of a timber pile supported relieving platform faced with a cast-in-place concrete bulkhead wall. Berth 6 has a similar configuration to Berth 3 with a concrete cast-in-place superstructure supported by precast concrete piles. Berths 3, 4, 5, and 6 each have approximately 800 LF of berthing. The water depth at the face of Berths 3 through 6 varies from 35 feet to 16 feet below Mean Low Water (MLW).

The fender system at Wet Slip No. 1 consists of timber piles with timber chocks and wale. The wale system is bolted directly to the top of the seawall. Sea cushions are used to fend off ships and provide some energy absorption.

3.3.2 Design Structural Capacity

DESIGN STRUCTURAL CAPACITY SUMMARY TABLE				
PIER FACILITY BERTHING AND MOORING ALLOWABLE LOADS *				
FACILITY		DESIGN RATINGS	CALCULATED CAPACITY	
			BERTHING	MOORING
BERTH 3 (WET SLIP 1)		NONE FOUND	3.46 K/LF	1.42 K/LF
BERTHS 4 (WET SLIP 1)		NONE FOUND	3.46 K/LF	4.58 K/LF
BERTHS 5 (WET SLIP 1)		NONE FOUND	3.46 K/LF	4.58K/LF
BERTHS 6 (WET SLIP 1)		NONE FOUND	3.46 K/LF	1.97 K/LF
MOORING FIXTURE RATED AND CALCULATED ALLOWABLE LOADS *				
MOORING FIXTURE	QUANTITY	DESIGN RATINGS	CALCULATED RATING	
BERTH 3				
42 " TYPE 1 CLEATS	5	20 TONS	N/A	
26 " CLEATS	1	N/A	12 TONS	
50 TON BOLLARDS	2	50 TONS @HORIZONTAL	N/A	
		33 TONS @ 45 DEG.	N/A	
SINGLE BIT	1	55 TONS HORIZONTAL	N/A	
BERTH 4				
42 " TYPE 1 CLEATS	5	20 TONS	N/A	
42 " TYPE 2 CLEATS	3	20 TONS	N/A	
50 TON BOLLARDS	1	50 TONS @HORIZONTAL	N/A	
		33 TONS @ 45 DEG.	N/A	
BERTH 5				
42 " TYPE 1 CLEATS	5	20 TONS	N/A	
42 " TYPE 2 CLEATS	3	20 TONS	N/A	
50 TON BOLLARDS	1	50 TONS @HORIZONTAL	N/A	
		33 TONS @ 45 DEG.	N/A	
BERTH 6				
42 " TYPE 1 CLEATS	5	20 TONS	N/A	
26 " CLEATS	1	N/A	12 TONS	
50 TON BOLLARDS	3	50 TONS @HORIZONTAL	N/A	
		33 TONS @ 45 DEG.	N/A	
NOTES :				
* ALLOWABLE LOADS SHOWN ARE BASED ON ASSUMPTIONS . FOR ACTUAL LIVE LOAD				
LIMITS ADDITIONAL INVESTIGATION IS REQUIRED. SEE APPENDIX FOR COMPUTATIONS.				
N/A - NO INFORMATION AVAILABLE				

3.3.3 Existing Condition

The existing conditions of each mooring fixture are noted on Data Table No. 3 and in [FIG 3-3](#). The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. At Wet Slip No. 1 there is one fixture designated WS1-C29 (Berth 6) which is a 42-inch cleat that has a rating of #3 as a result of severe cracking at the concrete base. Loading on this cleat should be restricted until repairs can be made. There is also one fixture on Wet Slip No. 1 designated WS1-B8 (Berth 6) which has a #3 rating. This rating is the result of cracking of the concrete base underneath the bollard. This condition should be repaired as soon as possible; however, it currently does not effect the load rating on the bollard. All other fixtures at Wet Slip No. 1 are rated at #2 or higher and considered to be in good condition. Examples of typical fixtures are shown on the photo page of this section. The fender system at Wetslip 1 is in good operational condition.

An example view of the 3D model may be found on [FIG 3-3A](#).



Photo 3.3-1 Berth 3, fitting WS1-B2, Sta. 1+24, 50 ton bollard in good condition, #1 rating



Photo 3.3-2 Berth 4, fitting WS1-C7, Sta. 4+15.4, 42-inch type 1 cleat in good condition, #1 rating



Photo 3.3-3 Berth 4, fitting WS1-11, Sta. 7+29.8 42-inch type 2 cleat, #1 rating



Photo 3.3-4 Berth 5, fitting WS1-C18, Sta. 10+81.5, 42-inch type 1 cleat, #2 rating due to cracking of the concrete base



Photo 3.3-5 Berth 5, fitting WS1-B5, Sta. 13+55.5, 50 ton bollard in good condition, #2 rating



Photo 3.3-6 Berth 6, fitting WS1-C29, Sta. 17+14 42-inch type 1 cleat in good condition, concrete base exhibits cracking resulting in a #3 rating



Photo 3.3-7 Berth 6, fitting WS1-C29, Sta. 17+14, close up view of cracked concrete base in front of cleat



Photo 3.3-8 Berth 6, fitting WS1-B8 Sta. 17+78.5, 50 ton, bollard with cracking of the concrete base resulting in a #3 rating



Photo 3.3-9 Berth 6, fitting WS1-B8, Sta. 17+78.5, close up of deteriorated concrete base

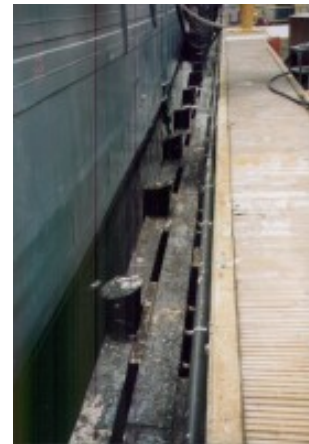


Photo 3.3-10 Berth 3, fender system in good operational condition overview looking west



Photo 3.3-11 Berth 4, fender system in good operational condition overview looking west



Photo 3.3-12 Berth 5, fender system in good operational condition overview looking east

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO.3-1

BERTH No.3								
FITTING #	NODE #	X	Y	Z	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
		COORD. (Ft)	COORD. (Ft)	COORD. (Ft)			FITTING	BASE
WS1-C1	50301	12.7	3	10.53	26" CLEAT	12	1	2
WS1-B1	50302	16	19	9.2	SINGLE BIT	55	1	N/A
WS1-C2	50303	50.8	1	8	42" CLEAT,TYPE 1	20	1	1
WS1-C3	50304	88	1	8	42" CLEAT,TYPE 1	20	1	1
WS1-B2	50305	124	2	10	BOLLARD	50	1	1
WS1-C4	50306	158.9	1	8	42" CLEAT,TYPE 1	20	1	2
WS1-C5	50307	207	1	8	42" CLEAT,TYPE 1	20	1	2
WS1-B3	50308	256.6	2	10	BOLLARD	50	2	2
WS1-C6	50309	358	5.4	9.6	42" CLEAT,TYPE 1	20	1	1
BERTH No.4								
WS1-C7	50401	415.4	5.4	9.6	42" CLEAT,TYPE 1	20	1	1
WS1-B4	50402	451.5	3	11.7	BOLLARD	20	1	1
WS1-C8	50403	524.8	5.4	9.8	42" CLEAT,TYPE 1	20	1	1
WS1-C9	50404	579.7	5.3	9.8	42" CLEAT,TYPE 1	20	1	1
WS1-C10	50405	675	5.3	9.8	42" CLEAT,TYPE 2	20	1	1
WS1-C11	50406	729.8	5.3	9.8	42" CLEAT,TYPE 2	20	1	1
WS1-C12	50407	765	5.3	9.8	42" CLEAT,TYPE 1	20	1	1
WS1-C13	50408	796.6	1.5	9.8	42" CLEAT,TYPE 2	20	1	1
WS1-C14	50409	835.7	1.5	9.8	42" CLEAT,TYPE 1	20	1	1

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 3-2

BERTH No. 5								
FITTING #	NODE #	X	Y	Z	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
		COORD. (Ft)	COORD. (Ft)	COORD. (Ft)			FITTING	BASE
WS1-C15	50501	953.8	1.5	9.8	42" CLEAT,TYPE 2	20	1	1
WS1-C16	50502	992.8	1.5	9.8	42" CLEAT,TYPE 2	20	1	2
WS1-C17	50503	1022.5	5.3	9.6	42" CLEAT,TYPE 2	20	1	2
WS1-C18	50504	1081.5	2.3	9.6	42" CLEAT,TYPE 1	20	1	2
WS1-C19	50505	1126.5	2.3	9.6	42" CLEAT,TYPE 1	20	1	2
WS1-C20	50506	1178.5	2.3	9.6	42" CLEAT,TYPE 1	20	1	1
WS1-C21	50507	1231.9	2.3	9.6	42" CLEAT,TYPE 1	20	1	1
WS1-C22	50508	1275.5	2.3	9.6	42" CLEAT,TYPE 1	20	1	1
WS1-C23	50509	1326.1	2.3	9.6	42" CLEAT,TYPE 1	20	1	1
WS1-B5	50510	1355.5	2.3	11.28	BOLLARD	50	1	2
WS1-C24	50511	1384.5	2.3	9.6	42" CLEAT,TYPE 1	50	1	2
BERTH No.6								
WS1-C25	50601	1434.8	2.33	9.6	42" CLEAT,TYPE 1	20	1	1
WS1-C26	50602	1481.9	2.33	9.6	26" CLEAT	12	1	2
WS1-B6	50603	1533	3.1	11.2	BOLLARD	50	1	2
WS1-C27	50604	1581	3	9.6	42"CLEAT, TYPE 1	20	1	1
WS1-C28	50605	1628.3	3	9.6	42"CLEAT, TYPE 1	20	1	1
WS1-B7	50606	1665.1	3.1	11.2	BOLLARD	50	1	2
WS1-C29	50607	1714	3	9.6	42"CLEAT, TYPE 1	20	1	3
WS1-C30	50608	1750.5	3	9.6	42"CLEAT, TYPE 1	20	1	1
WS1-B8	50609	1778.5	2	9.8	BOLLARD	50	1	3

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

3.4 INSPECTION OF BERTHS 7 AND 8

3.4.1 Description

Berths 7 and 8 were originally constructed in 1909 and consist of a timber pile supported relieving platform which is faced with a reinforced concrete sheet pile bulkhead with concrete seawall. The timber relieving platform is backfilled with soil and covered with a concrete deck. The water depth along Berths 7 and 8 varies from 24 feet to 28 feet Mean Low Water (MLW) at the face. Berths 7 and 8 consist of approximately 658 lineal feet of berthing. The fender system along the face of Berths 7 and 8 consist of timber piles with timber chocks and wale. The wale system is bolted directly to the top of the seawall and sea cushions are used to fend off ships and provide energy absorption.

3.4.2 Design Structural Capacity

DESIGN STRUCTURAL CAPACITY SUMMARY TABLE			
PIER FACILITY BERTHING AND MOORING ALLOWABLE LOADS *			
FACILITY	DESIGN RATINGS	CALCULATED CAPACITY	
		BERTHING	MOORING
BERTHS 7 & 8	NONE FOUND	3.46 K/LF	1.42 K/LF
MOORING FIXTURE RATED AND CALCULATED ALLOWABLE LOADS *			
MOORING FIXTURE	QUANTITY	DESIGN RATINGS	CALCULATED RATING
BERTH 7			
42 " TYPE 1 CLEATS	1	20 TONS	N/A
26 " CLEATS	8	N/A	12 TONS
50 TON BOLLARDS	3	50 TONS @HORIZONTAL 33 TONS @ 45 DEG.	N/A N/A
BERTH 8			
26 " CLEATS	10	N/A	12 TONS
50 TON BOLLARDS	3	55 TONS HORIZONTAL	N/A
NOTES :			
* ALLOWABLE LOADS SHOWN ARE BASED ON ASSUMPTIONS . FOR ACTUAL LIVE LOAD LIMITS ADDITIONAL INVESTIGATION IS REQUIRED. SEE APPENDIX FOR COMPUTATIONS.			
N/A - NO INFORMATION AVAILABLE			

3.4.3 Existing Condition

The existing conditions of each mooring fixture are noted in Data Table No. 4 and [FIG 3-4](#) in this section. The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. On Berth No. 7, Cleat No. B7-C4 is rated at 4, as this cleat is missing (fasteners failed). This fixture should not be considered in any berthing plan until replacement is complete. There is also a bollard designated as B7-B1 which has a 3 rating of the concrete base as a result of cracking underneath the bollard. This condition should be repaired as soon as possible; however, it currently does not effect the load rating on the bollard.

At Berth No. 8 two cleats, B7-C17 and B7-C18, have received a 4 rating as these cleats are missing. These cleats should not be considered in any berthing plan until replacement has been completed. All other fittings on Berth 8 and Berth 7 have 1 or 2 ratings and are considered to be in good condition. The fender system at Berths 7 and 8 is in good operational condition.

An example view of the 3D model may be found on [FIG 3-4A](#).



Photo3.4-1 Berth 7, fitting B7-C4, Sta. 1+37.4, 26-inch cleat bolts are cut off and cleat is missing, #4 rating

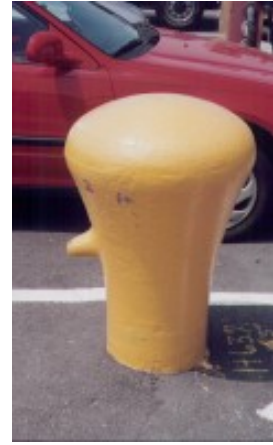


Photo 3.4-2 Berth 7, fitting B7-B2, Sta. 1+63.7, 50 ton bollard, base paved over, #1 rating



Photo 3.4-3 Berth 7 fitting B7-C9, Sta. 3+12.8, 26-inch cleat in good condition, #2 rating



Photo 3.4-4 Berth 8, fitting B7-C15, Sta. 5+10.8, 26-inch cleat exhibits heavy scaling, #2 rating



Photo 3.4-5 Berth 8, fitting B7-C18, Sta. 6+51.6, 26" cleat bolts are sheared off and cleat is missing, #4 rating

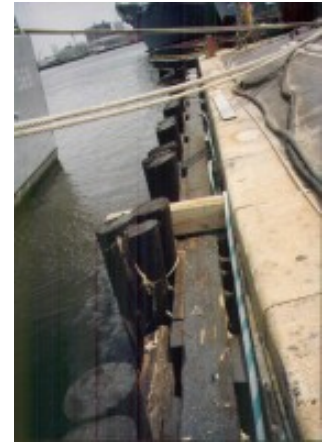


Photo 3.4-6 Berths 7 & 8, fender system in good operational condition overview looking south



Photo 3.4-7 Berth 7, fitting B7-B1, Sta. 0+11.6, 50-ton bollard with cracking of the concrete base, #3 rating

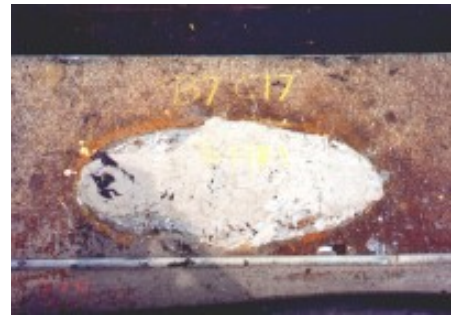


Photo 3.4-8 Berth 7, fitting B7-C17, Sta. 6+18.1, 26" cleat bolts are sheared off and cleat is missing, #4 rating

NORFOLK NAVAL SHIPYARD **MOORING CONDITION REPORT**

DATA TABLE NO.4

BERTH No. 7								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
B7-B1	50701	11.6	6.5	10.25	BOLLARD	50	1	3
B7-C1	50702	52.9	3.3	10.25	42" CLEAT, TYPE 1	20	2	2
B7-C2	50703	83.6	3.3	10.25	26" CLEAT	12	2	1
B7-C3	50704	110.6	3.3	10.25	26" CLEAT	12	2	1
B7-C4	50705	137.4	3.3	10.25	26" CLEAT	0	4	3
B7-B2	50706	163.7	16.5	8.8	BOLLARD	50	1	N/A
B7-C5	50707	178.7	2.5	9.9	26" CLEAT	12	2	2
B7-C6	50708	210.2	2.5	9.9	26" CLEAT	12	1	2
B7-C7	50709	241.6	2.5	9.9	26" CLEAT	12	2	1
B7-B3	50711	277.2	16.5	8.8	BOLLARD	55	1	N/A
B7-C8	50710	278	2.5	9.9	26" CLEAT	12	2	2
B7-C9	50712	312.8	2.5	9.9	26" CLEAT	12	2	2
BERTH No. 8								
B7-C10	50801	348.5	2.5	9.9	26" CLEAT	12	1	2
B7-C11	50802	378	2.5	9.9	26" CLEAT	12	1	2
B7-C12	50803	413.8	2.5	9.9	26" CLEAT	12	1	2
B7-B4	50804	415	16.5	8.8	BOLLARD	55	1	N/A
B7-C13	50805	445	2.5	9.9	26" CLEAT	12	2	2
B7-C14	50806	479.3	2.5	9.9	26" CLEAT	12	1	2
B7-C15	50807	510.8	2.5	9.9	26" CLEAT	12	2	2
B7-C16	50808	557.5	2.5	9.9	26" CLEAT	12	2	2
B7-B4.5	50809	568.5	16.5	8.8	BOLLARD	55	1	1
B7-B5	50810	601	83	8.8	BOLLARD	55	1	N/A
B7-C17	50811	618.1	2.5	7.67	26" CLEAT	0	4	4

B7-C18	50812	651.6	2.5	7.67	26" CLEAT	0	4	4
B7-C19	50813	696.8	1.33	7.67	26" CLEAT	12	1	1

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)



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3.5 INSPECTION OF BERTHS 9 AND 10 AND FERRY SLIP

3.5.1 Description

Berths 9 and 10 were constructed circa 1900. Both structures are pile supported open pier structures which are supported by timber piles, timber pile cap, timber stringers, and a concrete deck. The inside perimeter of these pier structures consist of a combination of steel sheet pile bulkhead and timber sheet pile bulkhead. Water depth along Berths 9 and 10 ranges from 5 feet to 26 feet Mean Low Water (MLW).

The Ferry Slip is a pile supported structure that is approximately 150 feet long. This structure was originally constructed in 1909 and consists of a timber pile supported open structure that varies from 16 feet to 90 feet wide. Water depth along the Ferry Slip ranges from 1 foot to approximately 26 feet.

The fender system at the Ferry Slip and along Berths 9 and 10 consists of timber piles and timber chocks and wale. The wale system is bolted directly to the top of the pier structure. Berths 9 and 10 each have approximately 300 LF of berthing. The ferry slip has approximately 100 LF of berthing.

3.5.2 Design Structural Capacity

DESIGN STRUCTURAL CAPACITY SUMMARY TABLE				
PIER FACILITY BERTHING AND MOORING ALLOWABLE LOADS *				
FACILITY		DESIGN RATINGS	CALCULATED CAPACITY	
			BERTHING	MOORING
BERTHS 9		NONE FOUND	3.46 K/LF	1.375 K/LF
BERTHS 10		NONE FOUND	3.46 K/LF	3.71 K/LF
FERRY SLIP		NONE FOUND	1 K/LF	1 K/LF
MOORING FIXTURE RATED AND CALCULATED ALLOWABLE LOADS *				
MOORING FIXTURE	QUANTITY	DESIGN RATINGS	CALCULATED RATING	
BERTH 9				
42 " TYPE 1 CLEATS	4	20 TONS	N/A	
42 " TYPE 3 CLEATS	1	20 TONS	N/A	
26 " CLEATS	6	N/A	12 TONS	
BERTH 10				
26 " CLEATS	5	N/A	12 TONS	
29" CLEATS	5	N/A	12 TONS	
FERRY SLIP				
14" CLEATS	1	N/A	N/A	
26" CLEATS	3	N/A	12 TONS	
NOTES :				
* ALLOWABLE LOADS SHOWN ARE BASED ON ASSUMPTIONS . FOR ACTUAL LIVE LOAD LIMITS ADDITIONAL INVESTIGATION IS REQUIRED. SEE APPENDIX FOR COMPUTATIONS.				
N/A - NO INFORMATION AVAILABLE				

3.5.3 Existing Condition

The existing conditions of each mooring fixture are noted in Data Table No. 5 and [FIG 3-5](#) in this Section. The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. At Berth No. 9 and the ferry slip, fittings FS-C2, B9-C2, and B9-C6 have a 4 rating as a result of rot of the supporting timber pier and blocking below the cleat. Fitting Nos. FS-C3, FS-C4, B9-C1, B9-C3, B9-C4, B9-C7, and B9-C11 have received a 3 rating as a result of dry rot of the blocking and timber below the cap. The cleats which have a 4 rating should not be used until repairs can be made. Cleats that have a 3 rating should be repaired as soon as possible. All other fixtures at Berth 9 are rated 2 or higher and are considered to be in good condition.

On Berth 10 there is one fitting, B10-C10, which has received a 3 rating as the result of cracking of the concrete in front of the cleat. This condition should be repaired as soon as possible; however, it currently does not effect the load rating on the cleat. All other fixtures at Berth 10 are rated at 2 or higher and are considered to be in good condition. Examples of typical fixtures of both Berths 9 and 10 are shown on the photos of this section.

The fender system at Berths 9 and 10 exhibits moderate deterioration and requires repair on a priority basis.

An example view of the 3D model may be found on [FIG 3-5A](#).



Photo 3.5-1 Berth 9, fitting B9-C4, Sta. 0+92.8, 42" type 1 cleat in good condition with concrete base exhibiting cracking, #3 rating



Photo 3.5-2 Berth 9, fitting B9-C5, Sta. 1+24, 42" type 3 cleat in good condition, #2 rating



Photo 3.5-3 Berth 9 fitting B9-C6, Sta. 1+96, 26" cleat on timber base exhibiting rot resulting in a #4 rating



Photo 3.5-4 Berth 9, fitting B9-C10, Sta. 2+94, 26" cleat in good condition, #1 rating



Photo 3.5-5 Berth 10, fitting B10-C2, Sta. 0+31, 29" cleat in good condition, #1 rating



Photo 3.5-6 Berth 10, fitting B10-C9, Sta. 2+57, 26" cleat in good condition, #2 rating



Photo 3.5-7 Berth 10, fitting B10-C10 Sta. 2+89, 26" cleat in good condition, cracking noted on concrete deck resulting in a #3 rating



Photo 3.5-8 Berth 9, fender system with moderate deterioration looking east



Photo 3.5-9 Berth 10, fender system with moderate deterioration looking east



Photo 3.5-10 Berth 10, Ferry slip, fender system with minor deterioration looking west



Photo 3.5-11 Berth 9, fitting B9-C1, Sta. 18, 42" cleat (Type 1) timber base exhibits dry rot, #3 rating



Photo 3.5-12 Berth 9, fitting B9-C2, Sta. 37, 42" cleat (Type 1) timber base exhibits dry rot, #4 rating



Photo 3.5-13 Berth 9, fitting B9-C3, Sta. 69, 26" cleat timber base exhibits dry rot, #3 rating



Photo 3.5-14 Berth 9, fitting B9-C7, Sta. 2+27, 26" cleat, timber base exhibits dry rot, #3 rating



Photo 3.5-15 Berth 9, fitting B9-C11, Sta. 3+08, 26" cleat, timber base exhibits dry rot, #3 rating



Photo 3.5-16 Ferry Slip, fitting FS-C2, Sta. 1+04, 26" cleat timber base exhibits dry rot, #4 rating



Photo 3.5-17 Ferry Slip, fitting FS-C3, Sta. 1+23, 26" cleat timber base exhibits dry rot, #3 rating



Photo 3.5-18 Ferry Slip, fitting FS-C4, Sta. 1+61, 26" cleat timber base exhibits dry rot, #3 rating

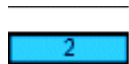
NORFOLK NAVAL SHIPYARD **MOORING CONDITION REPORT**

DATA TABLE NO.5

BERTH No.9								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
B9-C1	50901	18	1	7.29	42" CLEAT, TYPE 1	20	1	3
B9-C2	50902	37	1	7.29	42" CLEAT, TYPE 1	0	1	4
B9-C3	50903	69	0.5	7.29	26" CLEAT	12	2	3
B9-C4	50904	92.8	1	7.29	42" CLEAT, TYPE 1	20	1	3
B9-C5	50905	124	1	7.29	42" CLEAT, TYPE 3	20	2	2
B9-C6	50906	196	0.5	7.29	26" CLEAT	0	2	4
B9-C7	50907	227	0.5	7.29	26" CLEAT	12	2	3
B9-C8	50908	252	1	7.29	42" CLEAT, TYPE 1	20	2	2
B9-C9	50909	284	1	7.29	26" CLEAT	12	1	2
B9-C10	50910	294	0.5	8.29	26" CLEAT	12	1	1
B9-C11	50911	308	0.5	7.29	26" CLEAT	12	2	3
BERTH No. 10								
B10-C1	51001	3	1.3	7.29	29" CLEAT	20	1	1
B10-C2	51002	31	1.3	7.29	29" CLEAT	20	1	1
B10-C3	51003	63	1.3	7.29	29" CLEAT	20	1	1
B10-C4	51004	96	1.3	7.29	29" CLEAT	20	1	1
B10-C5	51005	129	1.3	7.29	29" CLEAT	20	1	1
B10-C6	51006	160	1.3	7.29	26" CLEAT	12	1	2
B10-C7	51007	192	1.3	7.29	26" CLEAT	12	2	1
B10-C8	51008	224	1.3	7.29	26" CLEAT	12	2	1
B10-C9	51009	257	1.3	7.29	26" CLEAT	12	2	2
B10-C10	51010	289	1.3	7.29	26" CLEAT	12	2	3
FERRY SLIP								
FS-C1	50920	7	1	7.29	14" CLEAT	NR	2	2
FS-C2	50921	104	1	7.29	26" CLEAT	12	2	4
FS-C3	50922	123	1	7.29	26" CLEAT	12	2	3
FS-C4	50923	161	1	7.29	26" CLEAT	12	2	3

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)



2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)



3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)



4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)



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3.6 INSPECTION OF BERTHS 11 AND 12

3.6.1 Description

Berths 11 and 12 were originally built in 1910 and are timber pile supported relieving platforms with timber pile caps and deck with soil fill above. The platforms are faced with reinforced concrete sheet piling. The concrete sheet piling for both berths have concrete seawalls and retain the backfill soil. The fill is covered with a concrete deck in combination with bituminous paving.

Berths 11 and 12 have approximately 625 lineal feet of berthing. Water depths in front of Berths 11 and 12 vary from 23.1 feet to 26.9 feet. The fender system at Berths 11 and 12 consist of timber piles with timber chocks and wale. The wale system is bolted directly to the top of the concrete seawall. Sea cushions are used to fend off ships and provide energy absorption.

3.6.2 Design Structural Capacity

<u>DESIGN STRUCTURAL CAPACITY SUMMARY TABLE</u>			
PIER FACILITY BERTHING AND MOORING ALLOWABLE LOADS *			
FACILITY	DESIGN RATINGS	CALCULATED CAPACITY	
		BERTHING	MOORING
BERTHS 11 & 12	NONE FOUND	3.46 K/LF	1.42 K/LF
MOORING FIXTURE RATED AND CALCULATED ALLOWABLE LOADS *			
MOORING FIXTURE	QUANTITY	DESIGN RATINGS	CALCULATED RATING
BERTH 11			
26 " CLEATS	8	N/A	12 TONS
50 TON BOLLARDS	2	50 TONS @HORIZONTAL 33 TONS @ 45 DEG.	N/A N/A
SINGLE BIT	2\	N/A	55 TONS HORIZONTAL
BERTH 12			
26 " CLEATS	9	N/A	12 TONS
50 TON BOLLARDS	5	50 TONS @HORIZONTAL 33 TONS @ 45 DEG.	N/A N/A
* ALLOWABLE LOADS SHOWN ARE BASED ON ASSUMPTIONS . FOR ACTUAL LIVE LOAD LIMITS ADDITIONAL INVESTIGATION IS REQUIRED. SEE APPENDIX FOR COMPUTATIONS.			
N/A - NO INFORMATION AVAILABLE			

3.6.3 Existing Condition

The existing conditions of each mooring fixture are noted in Data Tables No. 11 and No. 12 and [FIG 3-6](#) in this section . The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. At Berths 11 and 12 there is one fitting B11-C2 which has received a 4 rating. This fitting is missing and should not be considered for use in any berthing plan until it is replaced. All other fittings at Berths 11 and 12 are rated at 2 or higher and are considered to be in good condition. Examples of typical fittings are shown on the photo pages of this section. The fender system at Berths 11 and 12 is in good operational condition.

An example view of the 3D model may be found on [FIG 3-6A](#).



Photo 3.6-1 Berth 11, fitting B11-B1, Sta. 0+50, single bitt in good condition, #1 rating



Photo 3.6-2 Berth 11, fitting B11-B2, Sta. 0+71.7, bollard in good condition, #1 rating



Photo 3.6-3 Berth 11, fitting B11-C3, Sta. 0+89.5, 26" cleat in good condition, #1 rating



Photo 3.6-4 Berth 12, fitting B11-C10, Sta. 3+62, 26" cleat exhibiting corrosion, #2 rating



Photo 3.6-5 Berth 12, fitting B11-C17, Sta. 6+19 26" cleat in good condition, #1 rating



Photo 3.6-6 Berth 11 & 12, fender system in good operational condition looking north



Photo 3.6-7 Berth 11, fitting B11-C2, Sta. 0+55, 26" cleat, fitting is missing, #4 rating

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 6-1

BERTH No. 11								
FITTING #	NODE #	X	Y	Z	TYPE OF FITTING	LINE PULL *	CONDITION OF FITTING	
		COORD. (Ft)	COORD. (Ft)	COORD. (Ft)			FITTING	BASE
B11-C1	51101	22.4	1.3	7.29	26" CLEAT	12	2	1
B11-B1	51102	50	26	8.59	SINGLE BIT	55	1	N/A
B11-C2	51103	55	1.3	7.29	26" CLEAT	0	4	4
B11-B2	51104	71.7	12	8.59	BOLLARD	50	1	1
B11-C3	51105	89.5	3.5	10.79	26" CLEAT	12	1	1
B11-C4	51106	122.7	3.5	10.79	26" CLEAT	12	1	1
B11-B3	51107	132	10	8.59	BOLLARD	50	1	1
B11-C5	51108	156.4	3.5	10.79	26" CLEAT	12	1	1
B11-C6	51109	190.5	3.5	10.79	26" CLEAT	12	1	1
B11-C7	51110	224.8	3.5	10.79	26" CLEAT	12	2	1
B11-B4	51111	233	15	8.59	SINGLE BIT	55	1	N/A
B11-C8	51112	255	3.5	10.79	26" CLEAT	12	2	2

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION, SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO.6-2

BERTH No.12								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
B11-C9	51201	289.6	3.5	10.79	26" CLEAT	12	1	1
B11-B5	51202	313.7	10	8.59	BOLLARD	50	1	1
B11-C10	51203	362	3.5	10.79	26" CLEAT	12	2	2
B11-C11	51204	412.7	3.5	10.79	26" CLEAT	12	2	1
B11-B6	51205	418.2	10.5	8.59	BOLLARD	50	1	1
B11-B7	51206	459	10.1	8.59	BOLLARD	50	1	N/A
B11-C12	51207	467.6	3.5	10.79	26" CLEAT	12	2	1
B11-C13	51208	500	3.5	10.79	26" CLEAT	12	2	1
B11-B8	51209	519	10.5	8.59	BOLLARD	50	1	1
B11-C14	51210	529	1.3	7.67	26" CLEAT	12	1	1
B11-B9	51211	577	13.55	8.59	BOLLARD	50	1	N/A
B11-C15	51212	560	1.3	7.67	26" CLEAT	12	1	1
B11-C16	51213	594.6	1.3	7.67	26" CLEAT	12	1	1
B11-C17	51214	619	1.3	7.67	26" CLEAT	12	1	1

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

3.7 INSPECTION OF BERTHS 13, 14, 15, 16 AND 17

3.7.1 Description

A. BERTH 13

Berth 13 is presently inoperative and has no berthing capacity on its north side. However, there is approximately 50 feet of berthing at the end of the berth and approximately 100 feet of berthing along the south face.

The timber pile supported portion of Berth 13 is in a state of disrepair with the timber deck removed and pile field abandoned in-place. The remaining portions of Berth 13 consist of a steel sheet pile bulkhead which runs from Dry Dock No. 1 forming a peninsula approximately halfway between Dry Dock No. 1 and Dry Dock No. 2, ending at the abutment of Dry Dock No. 2.

Water depths in front of Berth 13 vary from a minimum of 0.9 feet to a maximum of 30 feet below low water datum. The fender system at Berth 13 consists of a hung timber rub strip system with timber pile clusters at the corner of the peninsula. The timber run strip system is bolted directly to the top of the concrete cap on the steel sheet piles.

B. BERTHS 14 and 15

Berths 14 and 15 were built in 1907 and Berth 15 was rebuilt in the 1960's. Berths 14 and 15 are pile-supported open structures. Berth 14 is 105 feet long by 74 feet wide, while Berth 15 is 125 long by 52 feet wide. The berths have a combined bulkhead of 311 lineal feet. Water depth along Berths 14 and 15 ranged from approximately 2 feet to 15 feet maximum.

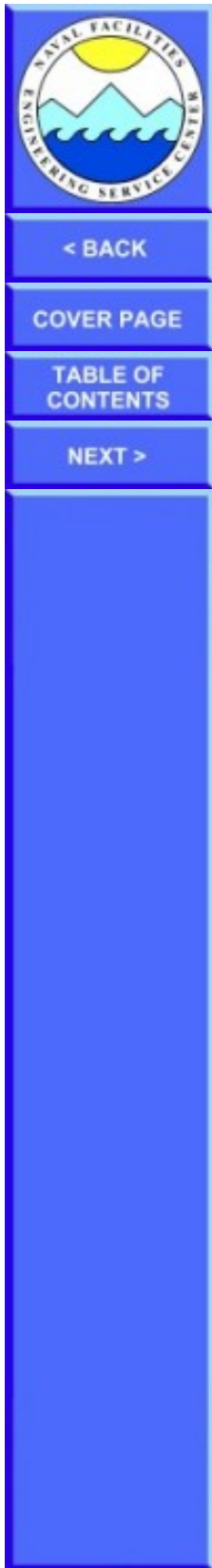
Berths 14 and 15 both have a timber pile supported fender system with timber chocks and timber wale. The wale is bolted directly to the top of the concrete deck. Timber camels are used to fend off barges currently berthed at Berths 14 and 15.

C. BERTHS 16 and 17

Berths 16 and 17 were originally constructed in 1925 and were rebuilt in 1968. Berths 16 and 17 are open piers with a timber superstructure. Berths 16 and 17 form a pier that is approximately 133 ft long by 60 ft wide. Each berth has approximately 133 LF of berthing.

Water depths in front of Berths 16 and 17 vary from 21.1 feet to 25.4 feet on the north face and 11.7 feet to 21.4 feet on the south face (MLW). The fender system along the face of Berths 16 and 17 consists of timber piles with timber chocks and wale. The wale system is bolted directly to the top of the seawall and timber camels are used to fend off ships.

3.7.2 Design Structural Capacity



DESIGN STRUCTURAL CAPACITY SUMMARY TABLE				
PIER FACILITY BERTHING AND MOORING ALLOWABLE LOADS *				
FACILITY		DESIGN RATINGS	CALCULATED CAPACITY	
			BERTHING	MOORING
BERTH 13		NONE FOUND	N/A	N/A
BERTHS 14 & 15		NONE FOUND	3.46 K/LF	N/A**
BERTHS 16 & 17		NONE FOUND	3.46 K/LF	N/A**
MOORING FIXTURE RATED AND CALCULATED ALLOWABLE LOADS *				
MOORING FIXTURE	QUANTITY	DESIGN RATINGS	CALCULATED RATING	
BERTH 13				
42 " TYPE 1 CLEATS	1	20 TONS	N/A	
42 " TYPE 2 CLEATS	1	20 TONS	N/A	
50 TON BOLLARDS	1	50 TONS @HORIZONTAL	N/A	
		33 TONS @ 45 DEG.	N/A	
CANNON	1	N/A	N/A	
BERTHS 14 & 15				
26 " CLEAT	1	N/A	12 TONS	
39 " CLEAT	1	N/A	12 TONS	
42 " TYPE 1 CLEATS	8	20 TONS	N/A	
50 TON BOLLARDS	2	50 TONS @HORIZONTAL	N/A	
		33 TONS @ 45 DEG.	N/A	
BERTHS 16 & 17				
26 " CLEATS	11	N/A	12 TONS	
NOTES :				
* ALLOWABLE LOADS SHOWN ARE BASED ON ASSUMPTIONS . FOR ACTUAL LIVE LOAD LIMITS ADDITIONAL INVESTIGATION IS REQUIRED. SEE APPENDIX FOR COMPUTATIONS.				
N/A - NO INFORMATION AVAILABLE				
** NO BATTER PILES PRESENT ON PIER ALLOWABLE LOADING IS UNKNOWN				

3.7.3 Existing Condition

A. BERTH 13

The existing conditions of each mooring fixture are noted in Data Table No. 7 and [FIG 3-7](#) in this section. The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. At Berth 13 all fittings and fitting bases have received ratings of 2 or higher and are considered to be in good condition. Examples of typical fittings are shown on the photo page of this section.

The fender system at Berth 13 exhibits moderate deterioration from Sta. 0+00 to St. 0+50, and minor deterioration from Sta. 0+50 to Dry Dock No. 2.

B. BERTHS 14 and 15

The existing conditions of each mooring fixture are noted in Data Table No. 7 and [FIG 3-7](#) in this section. The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. At Berths 14 and 15 there are three cleats which have received a 4 rating as the result of rotten supporting timber members below the concrete deck. There are five more fittings that have received a 3 rating as the result of suspected rot of supporting timber members below the concrete deck. The fittings that have received a 4 rating should not be considered for use in any berthing plan until the blocking below the deck is replaced. For the fittings that have received a 3 rating, caution should be used when considering these fixtures for use in any berthing plan. These fittings should also be repaired as soon as possible. All other fittings at Berths 14 and 15 have received a 2 rating or higher.

C. BERTHS 16 and 17

The existing conditions of each mooring fixture are noted in Data Table No. 7 and [FIG 3-7](#) in this section. The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. On Berth No. 16 there is also a cleat designated as B16C1 which has a 4 rating of the concrete based as a result of cracking underneath the cleat. This cleat should not be used until repairs are made. All other fittings on Berths 16

and 17 have a 1 or 2 rating and are considered to be in good condition.

The fender system at Berth 14 exhibits minor deterioration from Sta. 0+00 to Sta. 1+00 and moderate deterioration from Sta. 1+00 to Sta. 3+60 requiring repairs on a priority basis.

An example view of the 3D model may be found on [FIG 3-7A](#) and [FIG 3-7B](#).



Photo 3.7-1 Berth 13, fitting B13-B1, Sta. 0+29 Bollard in good condition, #1 rating



Photo 3.7-2 Berth 13, fitting B13-C1, Sta. 0+59 42" type 3 cleat in good condition, #2 rating



Photo 3.7-3 Berth 13, fitting B13-C2, Sta. 0+95 42" type 2 cleat in good condition, #1 rating



Photo 3.7-4 Berth 14, fitting B14-C3, Sta. 1+32, 42" type 2 cleat in good condition, timber blocking below deck exhibits rot, #3 rating



Photo 3.7-5 Berth 14, fitting B14-C3, Sta. 1+32.5 42" type 2 cleat, close-up view of timber at base



Photo 3.7-6 Berth 15, fitting B14-B2, Sta. 24+45, bollard in good condition, #2 rating



Photo 3.7-7 Berth 16, fitting B16-C1, Sta. 0+23 26" cleat, base exhibits cracking resulting in a #4 rating. Note that cleat is painted red as a warning to facility users



Photo 3.7-8 Berth 16, fitting B16-C2, Sta. 0+42.4 26" cleat in good condition, #1 rating



Photo 3.7-9 Berth 17, fitting B17-C1, Sta. 0+04 26" cleat in good condition, #2 rating



Photo 3.7-10 Berth 17, fitting B17-C4, Sta. 0+93 26" cleat in good condition, #2 rating



Photo 3.7-11 Berth 13, fender system with minor deterioration looking east



Photo 3.7-12 Berth 14, fender system with moderate deterioration looking south



Photo 3.7-13 Berth 15, fender system with moderate deterioration looking east



Photo 3.7-14 Berth 16, fender system with minor deterioration looking southeast



Photo 3.7-15 Berth 17, fender system with minor deterioration looking east



Photo 3.7-16 Berth 14, fitting B14-C4, Sta. 1+66.5, Type 2 42" cleat, timber blocking below deck exhibits dry rot, #3 rating



Photo 3.7-17 Berth 15, fitting B14-C8, Sta. 3+12.5, 42" Type 2 cleat, timber blocking below deck exhibits dry rot, #3 rating



Photo 3.7-18 Berth 16, fitting B16-C1, Sta. 0+23, 26" cleat, concrete base exhibits cracking, #4 rating

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 7-1

BERTH No.13								
FITTING #	NODE #	X	Y	Z	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
		COORD. (Ft)	COORD. (Ft)	COORD. (Ft)			FITTING	BASE
B13-B1	51301	29	7.5	7.67	BOLLARD	50	1	N/A
B13-C1	51302	59	2	8.67	42" CLEAT, TYPE 1	20	2	2
B13-C2	51303	95	5.5	8.67	42" CLEAT, TYPE 2	20	1	1
B13-B2	51304	140	39	8.67	CANNON	UNKNOWN	2	2
BERTH No.14								
B14-C1	51401	29.8	5	8.67	42" CLEAT, TYPE 2	20	1	1
B14-C2	51402	66.1	2	8.67	39" CLEAT	20	1	2
B14-B1	51403	80.7	9	9.67	BOLLARD	50	1	1
B14-C3	51404	132.5	1	7.67	42" CLEAT, TYPE 2	20	1	3
B14-C4	51405	166.5	1	7.67	42" CLEAT, TYPE 2	20	1	3
B14-C5	51406	210.2	1	7.67	42" CLEAT, TYPE 2	20	1	2
BERTH No.15								
B14-C6	51407	237.5	1	7.67	42" CLEAT, TYPE 2	20	1	2
B14-C7	51408	273.5	1	7.67	42" CLEAT, TYPE 2	20	1	2
B14-C8	51409	312.5	1	7.67	42" CLEAT, TYPE 2	20	1	3
B14-C9	51410	341.5	1	7.67	42" CLEAT, TYPE 2	20	1	1
B14-B2	51411	244.5	16	9.67	BOLLARD	50	1	2
B14-C10	51412	364.5	2	7.67	26" CLEAT	12	1	1
BERTH No. 16								
B16-C1	51601	23	1	7.67	26" CLEAT	12	2	4
B16-C2	51602	42.4	1	7.67	26" CLEAT	12	1	1
B16-C3	51603	73.2	1	7.67	26" CLEAT	12	2	2
B16-C4	51604	101.2	1	7.67	26" CLEAT	12	1	2
B16-C5	51605	129.2	1	7.67	26" CLEAT	12	1	1
B16-C6	51606	151.2	1	7.67	26" CLEAT	12	2	1
BERTH No. 17								
B17-C1	51701	4	1	7.67	26" CLEAT	12	1	2
B17-C2	51702	32	1	7.67	26" CLEAT	12	2	1
B17-C3	51703	62	1	7.67	26" CLEAT	12	2	1
B17-C4	51704	93	1	7.67	26" CLEAT	12	2	1
B17-C5	51705	122	1	7.67	26" CLEAT	12	2	2

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION, SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD



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3.8 INSPECTION OF BERTHS 18, 19, AND 20 AND BARGE BASIN

3.8.1 Description

A. BERTHS 18 and 19

Berths 18 and 19 were originally constructed in 1925 and were rebuilt in 1957. Berths 18 and 19 were constructed of square concrete piles supporting a concrete superstructure with an overall length of 145 feet with a maximum width of 90 feet.

Water depths in front of Berths 18 and 19 vary from 16.9 feet to 17.1 feet on the north face and 26.0 feet to 32.4 feet on the south face. The fender system along the face of Berths 18 and 19 consists of timber piles with timber chocks and wale. The wale system is bolted directly to the deck.

B. BERTH 20 and BARGE BASIN

Berth 20 and the Barge Basin were originally constructed in 1922. Berth 20 and the Barge Basin have a combination of timber and concrete piles which support a timber superstructure. The overall length is approximately 243 feet and 20 feet wide, with approximately 318 feet of steel sheetpiling along the northern face.

Water depths for Berth 20 vary from 24.9 feet to 30.2 feet. The fender system along the face of Berth 20 consists of timber piles with timber chocks and wale. The wale system is bolted directly to the top of the seawall.

3.8.2 Design Structural Capacity

DESIGN STRUCTURAL CAPACITY SUMMARY TABLE			
PIER FACILITY BERTHING AND MOORING ALLOWABLE LOADS *			
FACILITY	DESIGN RATINGS	CALCULATED CAPACITY	
		BERTHING	MOORING
BERTHS 18 & 19 BERTH 20	NONE FOUND NONE FOUND	3.46 N/A**	1.37 N/A**
MOORING FIXTURE RATED AND CALCULATED ALLOWABLE LOADS *			
MOORING FIXTURE	QUANTITY	DESIGN RATINGS	CALCULATED RATING
BERTHS 18 & 19			
42 " TYPE 1 CLEATS	10	20 TONS	N/A
50 TON BOLLARDS	1	50 TONS @ HORIZONTAL 33 TONS @ 45 DEG.	N/A N/A
BERTH 20			
24 " CLEAT	2	N/A	N/A
26 " CLEAT	4	N/A	12 TONS
30 " CLEAT	2	10 TONS	N/A
42 " TYPE 1 CLEATS	6	20 TONS	N/A
NOTES:			
* ALLOWABLE LOADS SHOWN ARE BASED ON ASSUMPTIONS . FOR ACTUAL LIVE LOAD LIMITS ADDITIONAL INVESTIGATION IS REQUIRED. SEE APPENDIX FOR COMPUTATIONS.			
N/A - NO INFORMATION AVAILABLE			
*** PIER ALLOWABLE LOADING IS UNKNOWN			

3.8.3 Existing Condition

A. BERTHS 18 and 19

The existing conditions of each mooring fixture are noted in Data Table No. 8 and [FIG 3-8](#) in this section. The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. All fittings on Berths 18 and 19 have 1 or 2 rating and are considered to be in good condition.

The fender system exhibits moderate deterioration over its entire length requiring repairs on a priority basis.

B. BERTH 20 and BARGE BASIN

The existing condition of each mooring fixture is noted in Data Table No. 8 and [FIG 3-8](#) in this section. The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. On the Barge Basin No. 4 BB-C4 is rated at 4, as this cleat has a broken horn. This fixture should not

be considered in any berthing plan until replacement is complete. All other fittings on Berth 20 and the Barge Basin have 1 or 2 rating and are considered to be in good condition.

The fender system on the north face of Berth 20 exhibits moderate deterioration requiring repairs on a priority basis. On the south side of Berth 20 (Barge Basin), the fender system is in good operational condition.

An example view of the 3D model may be found on [FIG 3-8A](#) and [FIG 3-8B](#).



Photo 3.8-1 Berth 18, fitting B18-1, Sta. 0+20 42" type 1 cleat in good condition, #1 rating



Photo 3.8-2 Berth 18, fitting B18-C2, Sta. 0+44 42" type 1 cleat in good condition, #2 rating



Photo 3.8-3 Berth 19, fitting B19-B1, Sta. 0+02, bollard in good condition, #2 rating



Photo 3.8-4 Berth 19, fitting B19-C2, Sta. 0+41 42" type 1 cleat in good condition, #2 rating



Photo 3.8-5 Berth 20, fitting B20-C1, Sta. 0+18 30" cleat in good condition, #1 rating



Photo 3.8-6 Berth 20, fitting B20-C3, Sta. 0+95 42" type 2 cleat, concrete base exhibits cracking resulting in a #2 rating



Photo 3.8-7 Berth 20, fitting B20-C7, Sta. 2+45 42" type 2 cleat in good condition, #1 rating



Photo 3.8-8 Barge Basin, fitting BB-C3, Sta. 1+13, 24" cleat in good condition, #1 rating

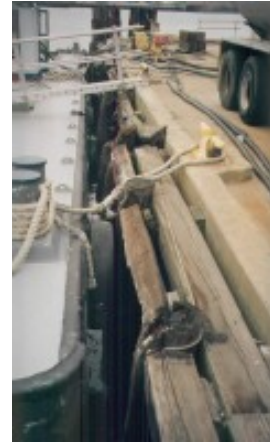


Photo 3.8-9 Barge Basin, fitting BB-C4, Sta. 1+36, 24" cleat in poor condition with broken horn and a #4 rating



Photo 3.8-10 Berth 18, fender system with moderate deterioration looking east

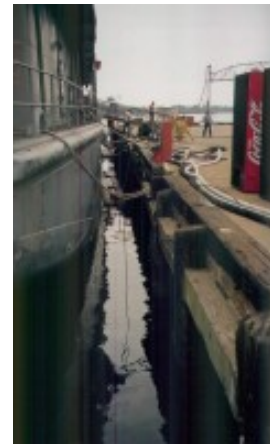


Photo 3.8-11 Berth 19, fender system with moderate deterioration looking east



Photo 3.8-12 Berth 20, fender system with moderate deterioration looking east

Photo 3.8-13 Barge Basin, fender system with minor deterioration looking northwest



NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 8-1

BERTH No. 18								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
B18-C1	51801	20	1	8.1	42"CLEAT,TYPE1	20	1	1
B18-C2	51802	44	1	8.1	42"CLEAT,TYPE1	20	1	2
B18-C3	51803	80	1	8.1	42"CLEAT,TYPE1	20	1	2
B18-C4	51804	102	1	8.1	42"CLEAT,TYPE1	20	1	2
B18-C5	51805	134	1	8.1	42"CLEAT,TYPE1	20	1	2
BERTH No.19								
B19-B1	51901	2	8	9.69	BOLLARD	50	2	1
B19-C1	51902	4	1	8.19	42"CLEAT TYPE 1	20	2	2
B19-C2	51903	41	1	8.19	42"CLEAT TYPE 1	20	2	1
B19-C3	51904	65	1	8.19	42"CLEAT TYPE 1	20	2	2
B19-C4	51905	90.5	1	8.19	42"CLEAT TYPE 1	20	2	1
B19-C5	51906	129	1	8.19	42"CLEAT TYPE 1	20	2	1
BERTH No. 20								
B20-C1	52001	18	1	9.19	30"CLEAT	12	1	1
B20-C2	52002	45.5	1	8.19	30"CLEAT	12	1	1
B20-C3	52003	95	1	8.19	42"CLEAT TYPE 1	20	1	2
B20-C4	52004	135	1	8.19	42"CLEAT TYPE 1	20	1	2
B20-C5	52005	174	1	8.19	42"CLEAT TYPE 1	20	1	2
B20-C6	52006	206	1	8.19	42"CLEAT TYPE 1	20	1	2
B20-C7	52007	245	1	8.19	42"CLEAT TYPE 1	20	1	1
B20-C8	52008	291	1	8.19	42"CLEAT TYPE 1	20	1	1
BERTH - Barge Basin								
BB-C1	52009	18	1.66	8.19	26" CLEAT	12	1	1
BB-C2	52010	78	1.66	8.19	26" CLEAT	12	1	1
BB-C3	52011	113	1.66	8.19	24" CLEAT	7	1	1
BB-C4	52012	136	1.66	8.19	24" CLEAT	0	4	1
BB-C5	52013	170	1.66	8.19	26" CLEAT	12	2	1
BB-C6	52014	231	1.66	8.19	26" CLEAT	12	2	1

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

3.9 INSPECTION OF BERTHS 22, 23, AND 24 (PIER 3)

3.9.1 Description

Berths 22, 23, and 24 were originally constructed in 1922 and consist of timber relieving platforms which are supported by timber piles. The platforms are faced with reinforced concrete sheetpiling. The concrete sheetpiling for the berths have concrete seawalls that are backfilled with soil. The fill is covered with a bituminous deck at the same elevation as the top of the concrete cap. Berth 22 has 84.5 linear feet of berthing and Berths 23 and 24 form the perimeter of Pier No. 3 with 1,000 linear feet of berthing.

Water depths for Berth 22 vary from 16.0 feet to 27.1 feet and for Berths 23 and 24 vary from 34.2 feet to 39.0 feet. The fender system along the face of Berths 22, 23, and 24 consists of timber piles with timber chocks and wale. The wale system is bolted directly to the top of the seawall.

3.9.2 Design Structural Capacity

DESIGN STRUCTURAL CAPACITY SUMMARY TABLE				
PIER FACILITY BERTHING AND MOORING ALLOWABLE LOADS *				
FACILITY		DESIGN RATINGS	CALCULATED CAPACITY	
			BERTHING	MOORING
BERTHS 22,23, & 24		NONE FOUND	3.46	4.58
MOORING FIXTURE RATED AND CALCULATED ALLOWABLE LOADS *				
MOORING FIXTURE	QUANTITY	DESIGN RATINGS	CALCULATED RATING	
BERTHS 22 23 & 24				
42 " TYPE 2 CLEATS	22	20 TONS	N/A	
50 TON BOLLARDS	10	50 TONS @HORIZONTAL	N/A	
		33 TONS @ 45 DEG.	N/A	
NOTES :				
* ALLOWABLE LOADS SHOWN ARE BASED ON ASSUMPTIONS . FOR ACTUAL LIVE LOAD				
LIMITS ADDITIONAL INVESTIGATION IS REQUIRED. SEE APPENDIX FOR COMPUTATIONS.				
N/A - NO INFORMATION AVAILABLE				

3.9.3 Existing Condition

A. BERTHS 23, 23, and 24

The existing conditions of each mooring fixture are noted in Data Table No. 9 and [FIG 3-9](#) in this section. The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. All fittings on Berths 22, 23, and 24 have 1 or 2 rating and are considered to be in excellent condition.

The fender system exhibits moderate deterioration requiring repair on a priority basis over its entire length. At Sta. 0+00 to Sta. 1+50, and at Sta. 3+50 to Sta. 5+00 the fender system exhibits severe deterioration and is non-functional.

An example view of the 3D model may be found on [FIG 3-9A](#).



Photo 3.9-1 Berth 22, fitting B22-C2, Sta. 0+61 20 ton, 42" type 2 cleat in good condition, #2 rating



Photo 3.9-2 Berth 23, fitting B23-C1, Sta. 0+11 20 ton, 42" type 2 cleat in good condition, #2 rating



Photo 3.9-3 Berth 23, fitting B23-B1, Sta. 0+26 bollard in good condition, #1 rating



Photo 3.9-4 Berth 23, fitting B23-C3, Sta. 1+02 42" type 2 cleat, #2 rating



Photo 3.9-5 Berth 23, fitting B23-B2, Sta. 1+27, bollard in good condition, #2 rating



Photo 3.9-6 Berth 23, fitting B23-B3, Sta. 2+29, bollard in good condition, #2 rating



Photo 3.9-7 Berth 23, fitting B23-C7, Sta. 3+06 42" type 2 cleat in good condition, #2 rating

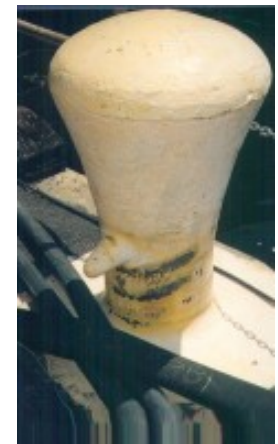


Photo 3.9-8 Berth 24, fitting B23-B10, Sta. 9+33, bollard in good condition, #2 rating



Photo 3.9-9 Berth 22, fender system with moderate deterioration looking southwest



Photo 3.9-10 Berth 24, fender system with moderate deterioration looking northwest

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 9-1

BERTH No. 22								
FITTING #	NODE #	X	Y	Z	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
		COORD. (Ft)	COORD. (Ft)	COORD. (Ft)			FITTING	BASE
B22-C1	52201	20	1.33	8.69	42"CLEAT,TYPE2	20	1	2
B22-C2	52202	61	1.33	8.69	42"CLEAT,TYPE2	20	2	2
BERTH No. 23								
B23-C1	52301	11	1.33	8.69	42"CLEAT,TYPE2	20	2	2
B23-B1	52302	26	2.16	10.19	BOLLARD	50	1	1
B23-C2	52303	52	1.33	8.69	42"CLEAT,TYPE2	20	1	2
B23-C3	52304	102	1.33	8.69	42"CLEAT,TYPE2	20	1	2
B23-B2	52305	127	2.16	10.19	BOLLARD	50	2	2
B23-C4	52306	153	1.33	8.69	42"CLEAT,TYPE2	20	1	2
B23-C5	52307	203	1.33	8.69	42"CLEAT,TYPE2	20	1	2
B23-B3	52308	229	2.16	10.19	BOLLARD	50	2	2
B23-C6	52309	255	1.33	8.69	42"CLEAT,TYPE2	20	1	2
B23-C7	52310	306	1.33	8.69	42"CLEAT,TYPE2	20	1	2
B23-B4	52311	330	2.16	10.19	BOLLARD	50	2	2

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 9-2

BERTH No.23 (Cont.)								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
B23-C8	52312	356	1.33	8.69	42"CLEAT,TYPE 2	20	1	2
B23-C9	52313	405	1.33	8.69	42"CLEAT,TYPE 2	20	2	2
B23-B5	52314	430	2.16	10.19	BOLLARD	50	2	2
B23-C10	52315	455	1.33	8.69	42"CLEAT,TYPE 2	20	1	2
BERTH No.24								
B23-C11	52401	505	1.33	8.69	42"CLEAT,TYPE 2	20	1	1
B23-B6	52402	530	2.16	10.19	BOLLARD	50	1	1
B23-C12	52403	555	1.33	8.69	42"CLEAT,TYPE 2	20	1	2
B23-C13	52404	605	1.33	8.69	42"CLEAT,TYPE 2	20	1	2
B23-B7	52405	630	2.16	10.19	BOLLARD	50	1	2
B23-C14	52406	707	1.33	8.69	42"CLEAT,TYPE 2	20	1	2
B23-C15	52407	757	1.33	8.69	42"CLEAT,TYPE 2	20	2	1
B23-B8	52408	732	1.33	8.69	BOLLARD	50	2	2
B23-C16	52409	806	1.33	8.69	42"CLEAT,TYPE 2	20	1	1
B23-C17	52410	858	1.33	8.69	42"CLEAT,TYPE 2	20	1	2
B23-B9	52411	832	2.16	10.19	BOLLARD	50	1	2
B23-C18	52412	909	1.33	8.69	42"CLEAT,TYPE 2	20	1	2
B23-C19	52413	958	1.33	8.69	42"CLEAT,TYPE 2	20	2	2
B23-B10	52414	933	2.16	10.19	BOLLARD	50	1	2
B23-C20	52415	1004	1.33	8.69	42"CLEAT,TYPE 2	20	1	N/A

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

3.10 INSPECTION OF BERTH 25

3.10.1 Description

Berth 25 was originally constructed in 1917. Berth 25 consists of a timber pile supported relieving platform which is faced with a reinforced concrete sheetpile bulkhead with concrete seawall. The timber relieving platform is backfilled with soil and covered with a concrete deck. There is approximately 290 linear feet of berthing at Berth 25.

Water depths for Berth 25 vary from 31.1 feet to 33.4 feet. The fender system along the face of Berth 25 consists of timber piles with timber chocks and wale. The wale system is bolted directly to the top of the seawall.

3.10.2 Design Structural Capacity

DESIGN STRUCTURAL CAPACITY SUMMARY TABLE			
PIER FACILITY BERTHING AND MOORING ALLOWABLE LOADS *			
FACILITY	DESIGN RATINGS	CALCULATED CAPACITY	
		BERTHING	MOORING
BERTH 25	NONE FOUND	3.46 K/LF	1.42 K/LF
MOORING FIXTURE RATED AND CALCULATED ALLOWABLE LOADS *			
MOORING FIXTURE	QUANTITY	DESIGN RATINGS	CALCULATED RATING
BERTH 25			
42 "TYPE 2 CLEATS	6	20 TONS	N/A
50 TON BOLLARDS	2	50 TONS @HORIZONTAL 33 TONS @ 45 DEG.	N/A N/A
NOTES: * ALLOWABLE LOADS SHOWN ARE BASED ON ASSUMPTIONS . FOR ACTUAL LIVE LOAD LIMITS ADDITIONAL INVESTIGATION IS REQUIRED. SEE APPENDIX FOR COMPUTATIONS. N/A - NO INFORMATION AVAILABLE			

3.10.3 Existing Condition

The existing conditions of each mooring fixture are noted in Data Table No. 10 and [FIG 3-10](#) in this section. The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. All fittings on Berth 25 have 1 or 2 ratings and are considered to be in good condition. The timber pile fender system at Berth 25 is rated as being in moderate condition and in need of significant repairs.

The fender system exhibits moderate deterioration requiring repairs on a priority basis.

An example view of the 3D model may be found on [FIG 3-10A](#).



Photo 3.10-1 Berth 25, fitting B25-B1, Sta. 0+88, bollard in good condition, #2 rating



Photo 3.10-2 Berth 25, fitting B25-C4 Sta. 1+63, 42" type 2 cleat in good condition, #1 rating



Photo 3.10-3 Berth 25, fitting B25-B2, Sta. 1+97, bollard in good condition, #2 rating



Photo 3.10-4 Berth 25, fitting B25-B2, Sta. 1+97 bollard, close-up of bolt end

NORFOLK NAVAL SHIPYARD **MOORING CONDITION REPORT**

DATA TABLE NO.10

BERTH No.25								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
B25-C1	52501	28	1.33	8.69	42"CLEAT,TYPE 2	20	1	2
B25-C2	52502	61	1.33	8.69	42"CLEAT,TYPE 2	20	1	2
B25-C3	52503	127	1.33	8.69	42"CLEAT,TYPE 2	20	1	1
B25-C4	52504	163	1.33	8.69	42"CLEAT,TYPE 2	20	1	1
B25-C5	52505	230	1.33	8.69	42"CLEAT,TYPE 2	20	1	2
B25-C6	52506	263	1.33	8.69	42"CLEAT,TYPE 2	20	1	2
B25-B1	52507	88	2.16	8.69	BOLLARD	50	1	2
B25-B2	52508	197	2.16	8.69	BOLLARD	50	1	2

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD



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3.11 INSPECTION OF BERTHS 26, 27, 28, 29 AND 30 (PIER 4)

3.11.1 Description

A. Berths 26 and 27

Berths 26 and 27 were originally constructed in 1923 and consist of a timber pile supported relieving platform which is faced with a reinforced concrete sheetpile bulkhead with concrete seawall. The timber relieving platform is backfilled with soil and covered with a concrete deck. Berths 26 and 27 have 1,000 linear feet of berthing.

Water depths for Berths 26 and 27 vary from 33.9 feet to 42.1 feet. The fender system along the face of Berths 26 and 27 consist of timber piles with timber chocks and wale. The wale system is bolted directly to the top of the seawall.

B. Berth 28

Berth 28 was originally constructed in 1923 and consists of a timber pile supported relieving platform which is faced with a reinforced concrete sheetpile bulkhead with concrete seawall. The timber relieving platform is backfilled with soil and covered with a concrete deck. Berth 28 has 80 linear feet of berthing.

Water depths for Berth 28 vary from 32.6 feet to 34.1 feet. The fender system along the face of Berth 28 consists of timber piles with timber chocks and wale. The wale system is bolted directly to the top of the seawall.

C. Berths 29 and 30

Berths 29 and 30 were originally constructed in 1923 and consist of a timber pile supported relieving platform which is faced with a reinforced concrete sheetpile bulkhead with concrete seawall. The timber relieving platform is backfilled with soil and covered with a concrete deck. Berths 29 and 30 have 1,000 linear feet of berthing.

Water depths for Berths 29 and 30 vary from 29.1 feet to 41.9 feet. The fender system along the face of Berths 29 and 30 consist of timber piles with timber chocks and wale. The wale system is bolted directly to the top of the seawall.

3.11.2 Design Structural Capacity

DESIGN STRUCTURAL CAPACITY SUMMARY TABLE			
PIER FACILITY BERTHING AND MOORING ALLOWABLE LOADS *			
FACILITY	DESIGN RATINGS	CALCULATED CAPACITY	
		BERTHING	MOORING
BERTHS 26, 27, 28, 29, AND 30 (PIER 4)	NONE FOUND	3.46 K/LF	5.6K/LF
MOORING FIXTURE RATED AND CALCULATED ALLOWABLE LOADS *			
MOORING FIXTURE	QUANTITY	DESIGN RATINGS	CALCULATED RATING
BERTHS 26 AND 27			
42 "TYPE 2 CLEATS	20	20 TONS	N/A
50 TON BOLLARDS	10	50 TONS @HORIZONTAL 33 TONS @ 45 DEG.	N/A N/A
BERTH 28			
42" TYPE 1 CLEATS	1	20 TONS	N/A
42 "TYPE 2 CLEATS	1	20 TONS	N/A
BERTHS 29 AND 30			
42" TYPE 1 CLEATS	2	20 TONS	N/A
42 "TYPE 2 CLEATS	18	20 TONS	N/A
50 TON BOLLARDS	10	50 TONS @HORIZONTAL 33 TONS @ 45 DEG.	N/A N/A
* ALLOWABLE LOADS SHOWN ARE BASED ON ASSUMPTIONS . FOR ACTUAL LIVE LOAD LIMITS ADDITIONAL INVESTIGATION IS REQUIRED. SEE APPENDIX FOR COMPUTATIONS.			
N/A - NO INFORMATION AVAILABLE			
** NO BATTER PILES PRESENT ON PIER ALLOWABLE LOADING IS UNKNOWN			

3.11.3 Existing Condition

The existing conditions of each mooring fixture are noted in Data Table Nos. 11 and [FIG 3-11](#) in this section. The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. All fittings on Berths 26, 27, 28, 29, and 30 have 1 or 2 ratings and are considered to be in good condition. The timber pile fender system at Berths 26 to 30 are rated as having minor damage but otherwise in good condition, except Berth 28 which has a moderate rating

requiring significant repairs. The fender system at these berths is functional.

An example view of the 3D model may be found on [FIG 3-11A](#).



Photo 3.11-1 Berth 26, fitting B26-C1, Sta. 0+20, 42"
type 2 cleat in good condition, #1 rating



Photo 3.11-2 Berth 26, fitting B26-B1, Sta. 0+84, bollard
in good condition, #2 rating due to minor cracking of the
concrete base



Photo 3.11-3 Berth 26, fitting B26-C3, Sta. 1+40, 42"
type 2 cleat in good condition, #1 rating



Photo 3.11-4 Berth 26, fitting B26-B3, Sta. 2+64, bollard
in good condition, #2 rating



Photo 3.11-5 Berth 26, fitting B26-C9, Sta. 4+30, 42"
type 2 cleat in good condition, #2 rating

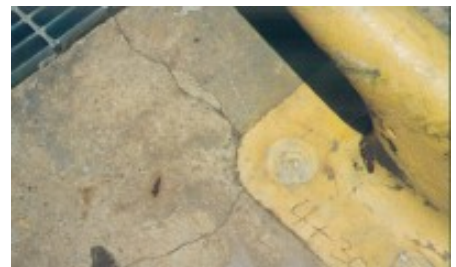


Photo 3.11-6 Berth 26, fitting B26-C9, Sta. 4+30, 42"
type 2 cleat close-up of cracked concrete at base



Photo 3.11-7 Berth 27, fitting B26-B8, Sta. 7+65, bollard in good condition, #2 rating due to abrasion damage on the barrel



Photo 3.11-8 Berth 27, fitting B26-B8, Sta. 7+65, bollard, close-up view of abrasion damage



Photo 3.11-9 Berth 28, fitting B28-C1, Sta. 0+25, 42" type 2 cleat in good condition, #2 rating



Photo 3.11-10 Berth 28, fitting B28-C2, Sta. 0+65, 42" type 1 cleat in good condition, #2 rating



Photo 3.11-11 Berth 29, fitting B29-C1, Sta. 0+17, 42" type 2 cleat in good condition, #2 rating



Photo 3.11-12 Berth 29, fitting B29-B1, Sta. 0+33, bollard in good condition, #2 rating



Photo 3.11-13 Berth 29, fitting B29-B3, Sta. 2+39, bollard in good condition, #2 rating



Photo 3.11-14 Berth 29, fitting B29-C10, Sta. 4+73, 42" type 2 cleat in good condition, #2 rating



Photo 3.11-15 Berth 30, fitting B29-C11, Sta. 5+13, 42" type 2 cleat in good condition, #2 rating



Photo 3.11-16 Berth 30, fitting B29-B6, Sta. 5+38, bollard in good condition, #2 rating



Photo 3.11-17 Berth 30, fitting B29-C15, Sta. 7+13, 42" type 1 cleat in good condition, #2 rating



Photo 3.11-18 Berth 30, fitting B29-C19, Sta. 2+39, 42" type 2 cleat in good condition, #2 rating



Photo 3.11-19 Berth 26, fender system with minor deterioration looking south



Photo 3.11-20 Berth 27, fender system with minor deterioration looking south



Photo 3.11-21 Berth 29, fender system with moderate deterioration looking northwest



Photo3.11-22 Berth 30, fender system with moderate deterioration looking east



NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 11-1

BERTH No.26								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
B26-C1	52601	20	1.33	8.7	42"CLEAT,TYPE 2	20	1	1
B26-B1	52602	84	2.16	10.2	BOLLARD	50	1	2
B26-C2	52603	100	1.33	8.7	42"CLEAT,TYPE 2	20	1	2
B26-C3	52604	140	1.33	8.7	42"CLEAT,TYPE 2	20	1	1
B26-B2	52605	170	2.16	10.2	BOLLARD	50	1	1
B26-C4	52606	195	1.33	8.7	42"CLEAT,TYPE 2	20	1	2
B26-C5	52607	235	1.33	8.7	42"CLEAT,TYPE 2	20	1	2
B26-B3	52608	264	2.16	10.2	BOLLARD	50	1	2
B26-C6	52609	289	1.33	8.7	42"CLEAT,TYPE 2	20	1	2
B26-C7	52610	330	1.33	8.7	42"CLEAT,TYPE 2	20	1	2
B26-B4	52611	360	2.16	10.2	BOLLARD	50	1	2
B26-C8	52612	390	1.33	8.7	42"CLEAT,TYPE 2	20	1	2
B26-C9	52613	430	1.33	8.7	42"CLEAT,TYPE 2	20	1	2
B26-B5	52614	465	2.16	10.2	BOLLARD	50	1	2
B26-C10	52615	490	1.33	8.7	42"CLEAT,TYPE 2	20	1	2
BERTH No.27								
B26-C11	52701	530	1.33	8.7	42"CLEAT,TYPE 2	20	1	2
B26-B6	52702	565	2.16	10.2	BOLLARD	50	1	1
B26-C12	52703	600	1.33	8.7	42"CLEAT,TYPE 2	20	1	2
B26-C13	52704	640	1.33	8.7	42"CLEAT,TYPE 2	20	1	2
B26-B7	52704	670	2.16	10.2	BOLLARD	50	1	1
B26-C14	52705	700	1.33	8.7	42"CLEAT,TYPE 2	20	1	2
B26-15	52706	740	1.33	8.7	42"CLEAT,TYPE 2	20	1	2
B26-B8	52707	765	2.16	10.2	BOLLARD	50	2	1
B26-C16	52708	800	1.33	8.7	42"CLEAT,TYPE 2	20	1	1
B26-C17	52709	840	1.33	8.7	42"CLEAT,TYPE 2	20	1	2
B26-B9	52710	870	2.16	10.2	BOLLARD	50	1	2
B26-C18	52711	900	1.33	8.7	42"CLEAT,TYPE 2	20	1	2
B26-C19	52712	940	1.33	8.7	42"CLEAT,TYPE 2	20	1	2
B26-B10	52713	970	2.16	10.2	BOLLARD	50	1	2
B26-C20	52714	985	1.33	8.7	42"CLEAT,TYPE 2	20	1	1

CONDITION RATING KEY

1	1= EXCELLENT (NEW - NO DAMAGE)
2	2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)
3	3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)
4	4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 11-2

BERTH 28								
FITTING #	NODE #	X	Y	Z	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
		COORD. (Ft)	COORD. (Ft)	COORD. (Ft)			FITTING	BASE
B28-C1	52801	25	2.16	10.2	42"CLEAT, TYPE 2	20	1	2
B28-C2	52802	65	2.16	10.2	42"CLEAT, TYPE 1	20	2	2
BERTH No.29								
B29-C1	52901	17	1.33	10.19	42"CLEAT, TYPE 2	20	2	2
B29-B1	52902	33	2.16	11.69	BOLLARD	50	1	2
B29-C2	52903	62	1.33	10.19	42"CLEAT, TYPE 2	20	1	2
B29-C3	52904	103	1.33	10.19	42"CLEAT, TYPE 2	20	1	2
B29-B2	52905	133	2.16	11.69	BOLLARD	50	1	2
B29-C4	52906	163	1.33	10.19	42"CLEAT, TYPE 2	20	1	2
B29-C5	52907	203	1.33	10.19	42"CLEAT, TYPE 2	20	1	1
B29-B3	52908	239	2.16	11.69	BOLLARD	50	1	2
B29-C6	52909	263	1.33	10.19	42"CLEAT, TYPE 2	20	1	2
B29-C7	52910	303	1.33	10.19	42"CLEAT, TYPE 2	20	1	2
B29-B4	52911	333	2.16	11.69	BOLLARD	50	1	2
B29-C8	52912	363	1.33	10.19	42"CLEAT, TYPE 2	20	2	2
B29-C9	52913	403	1.33	10.19	42"CLEAT, TYPE 2	20	1	2
B29-B5	52914	438	2.16	11.69	BOLLARD	50	1	2
B29-C10	52915	473	1.33	10.19	42"CLEAT, TYPE 2	20	1	2
BERTH 30								
B29-C11	53001	513	1.33	10.19	42"CLEAT, TYPE 2	20	1	2
B29-B6	53002	538	2.16	11.69	BOLLARD	50	1	2
B29-C12	53003	573	1.33	10.19	42"CLEAT, TYPE 2	20	1	2
B29-C13	53004	613	1.33	10.19	42"CLEAT, TYPE 1	20	1	2
B29-B7	53005	643	2.16	11.69	BOLLARD	50	1	2
B29-C14	53006	673	1.33	10.19	42"CLEAT, TYPE 2	20	1	2
B29-C15	53007	713	1.33	10.19	42"CLEAT, TYPE 1	20	1	2

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION, SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 11-3

BERTH No.30 (CONT.)								
FITTING #	NODE #	X	Y	Z	TYPE OF FITTING	LINE PULL *	CONDITION OF FITTING	
		COORD. (Ft)	COORD. (Ft)	COORD. (Ft)			FITTING	BASE
B29-B8	53008	738	2.16	11.69	BOLLARD	50	1	2
B29-C16	53009	768	1.33	10.19	42"CLEAT, TYPE 2	20	1	2
B29-C17	53010	809	1.33	10.19	42"CLEAT, TYPE 2	20	1	2
B29-B9	53011	833	2.16	11.69	BOLLARD	50	1	2
B29-C18	53012	863	1.33	10.19	42"CLEAT, TYPE 2	20	1	2
B29-C19	53013	903	1.33	10.19	42"CLEAT, TYPE 2	20	1	2
B29-B10	53014	919	2.16	11.69	BOLLARD	50	1	2
B29-C20	53015	983	1.33	10.19	42"CLEAT, TYPE 2	20	1	1

CONDITION RATING KEY



1= EXCELLENT (NEW - NO DAMAGE)



2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)



3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)



4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

3.12 INSPECTION OF BERTH 31

3.12.1 Description

Berth 31 was originally constructed in 1938 and consists of a timber pile supported relieving platform which is faced with a reinforced concrete sheetpile bulkhead with concrete seawall. The timber relieving platform is backfilled with soil and covered with a concrete deck. Berth 31 has 350 linear feet of berthing.

Water depths for Berth 31 vary from 27.1 feet to 33.9 feet. The fender system along the face of Berth 31 consists of timber piles with timber chocks and wale. The wale system is bolted directly to the top of the seawall and sea cushions are used to fend off ships and provide energy absorption.

3.12.2 Design Structural Capacity

DESIGN STRUCTURAL CAPACITY SUMMARY TABLE				
PIER FACILITY BERTHING AND MOORING ALLOWABLE LOADS *				
FACILITY		DESIGN RATINGS	CALCULATED CAPACITY	
			BERTHING	MOORING
BERTH 31		NONE FOUND	3.46 K/LF	7.74 K/LF
MOORING FIXTURE RATED AND CALCULATED ALLOWABLE LOADS *				
MOORING FIXTURE	QUANTITY	DESIGN RATINGS	CALCULATED RATING	
BERTH 31				
42 " TYPE 3 CLEATS	3	20 TONS	N/A	
42 " TYPE 2 CLEATS	4	20 TONS	N/A	
50 TON BOLLARDS	2	50 TONS @HORIZONTAL	N/A	
		33 TONS @ 45 DEG.	N/A	
NOTES :				
* ALLOWABLE LOADS SHOWN ARE BASED ON ASSUMPTIONS . FOR ACTUAL LIVE LOAD				
LIMITS ADDITIONAL INVESTIGATION IS REQUIRED. SEE APPENDIX FOR COMPUTATIONS.				
N/A - NO INFORMATION AVAILABLE				

3.12.3 Existing Condition

The existing conditions of each mooring fixture are noted in Data Table No. 12 and [FIG 3-12](#) in this section. The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. All fittings on Berth 31 have 1 or 2 ratings and are considered to be in good condition. The timber fender system at Berth 31 exhibits moderate deterioration and damage and should be repaired on a priority basis.

An example view of the 3D model may be found on [FIG 3-12A](#).



Photo 3.12-1 Berth 31, fitting B31-C2, Sta. 0+59, 42" type 2 cleat in good condition, #2 rating



Photo 3.12-2 Berth 31, fitting B31-B1, Sta. 0+92, bollard in good condition, #2 rating



Photo 3.12-3 Berth 31, fitting 31-C3, Sta. 1+25, 42" type 2 cleat in good condition, #1 rating



Photo 3.12-4 Berth 31, fitting 31-C6, Sta. 2+60, 42" type 3 cleat in good condition, #2 rating



Photo 3.12-5 Berth 31, fitting B31-B2, Sta. 3+14, bollard in good condition, #2 rating

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 12

BERTH No.31								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
B31-C1	53101	25	1.33	10.19	42"CLEAT, TYPE 2	20	1	2
B31-C2	53102	59	1.33	10.19	42"CLEAT, TYPE 2	20	2	2
B31-B1	53103	92	2.16	11.69	BOLLARD	50	1	2
B31-C3	53104	125	1.33	10.19	42"CLEAT, TYPE 2	20	1	1
B31-C4	53105	158	1.33	10.19	42"CLEAT, TYPE 2	20	1	2
B31-C5	53106	220	1.33	10.89	42"CLEAT, TYPE 3	20	1	1
B31-C6	53107	260	1.33	10.89	42"CLEAT, TYPE 3	20	2	2
B31-C7	53108	300	1.33	10.89	42"CLEAT, TYPE 3	20	2	1
B31-B2	53109	314	2.16	11.69	BOLLARD	50	1	2

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD



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3.13 INSPECTION OF BERTHS 32, 33, 34, 35, AND 36 (PIER 5)

3.13.1 Description

A. Berths 32 and 33

Berths 32 and 33 were originally constructed in 1940 and consist of a timber pile supported relieving platform which is faced with a reinforced concrete sheetpile bulkhead with concrete seawall. The timber relieving platform is backfilled with soil and covered with a concrete deck. Berths 32 and 33 have 1,000 linear feet of berthing.

Water depths for Berths 32 and 33 vary from 25.6 feet to 33.4 feet. The fender system along the face of Berths 32 and 33 consist of timber piles with timber chocks and wale. The wale system is bolted directly to the top of the seawall and sea cushions are used to fend off ships and provide energy absorption.

B. Berth 34

Berth 34 was originally constructed in 1940 and consists of a timber pile supported relieving platform which is faced with a reinforced concrete sheetpile bulkhead with concrete seawall. The timber relieving platform is backfilled with soil and covered with a concrete deck. Berth 34 has 150 linear feet of berthing.

Water depths for Berth 34 vary from 32.6 feet to 39.8 feet. The fender system along the face of Berth 34 consists of timber piles with timber chocks and wale. The wale system is bolted directly to the top of the seawall.

C. Berths 35 and 36

Berths 35 and 36 were originally constructed in 1940 and consist of a timber pile supported relieving platform which is faced with a reinforced concrete sheetpile bulkhead with concrete seawall. The timber relieving platform is backfilled with soil and covered with a concrete deck. Berths 35 and 36 have 960 linear feet of berthing.

Water depths for Berths 35 and 36 vary from 39.0 feet to 36.3 feet. The fender system along the face of Berths 35 and 36 consist of timber piles with timber chocks and wale. The wale system is bolted directly to the top of the seawall.

3.13.2 Design Structural Capacity

<u>DESIGN STRUCTURAL CAPACITY SUMMARY TABLE</u>			
PIER FACILITY BERTHING AND MOORING ALLOWABLE LOADS *			
FACILITY	DESIGN RATINGS	CALCULATED CAPACITY	
		BERTHING	MOORING
BERTHS 32, 33, 35, AND 36	NONE FOUND	3.46 K/LF	5.6K/LF
BERTH 34	NONE FOUND	3.46 K/LF	4.58K/LF
MOORING FIXTURE RATED AND CALCULATED ALLOWABLE LOADS *			
MOORING FIXTURE	QUANTITY	DESIGN RATINGS	CALCULATED RATING
<u>BERTHS 32 AND 33</u>			
42 " TYPE 1 CLEATS	2	20 TONS	N/A
42 " TYPE 2 CLEATS	6	20 TONS	N/A
42 " TYPE 3 CLEATS	17	20 TONS	N/A
HIGH DOUBLE BIT	5	43TONS @HORIZONTAL 31 TONS @ 45 DEG.	N/A N/A
50 TON BOLLARDS	5	50 TONS @HORIZONTAL 33 TONS @ 45 DEG.	N/A N/A
<u>BERTH 34</u>			
42 " TYPE 3 CLEATS	2	20 TONS	N/A
50 TON BOLLARDS	3	50 TONS @HORIZONTAL 33 TONS @ 45 DEG.	N/A N/A
<u>BERTHS 35 AND 36</u>			
42 " TYPE 2 CLEATS	20	20 TONS	N/A
50 TON BOLLARDS	5	50 TONS @HORIZONTAL 33 TONS @ 45 DEG.	N/A N/A
HIGH DOUBLE BIT	5	43TONS @HORIZONTAL 31 TONS @ 45 DEG.	N/A N/A
* ALLOWABLE LOADS SHOWN ARE BASED ON ASSUMPTIONS . FOR ACTUAL LIVE LOAD LIMITS ADDITIONAL INVESTIGATION IS REQUIRED. SEE APPENDIX FOR COMPUTATIONS.			
N/A - NO INFORMATION AVAILABLE			

3.13.3 Existing Condition

A. Berths 32 and 33

The existing conditions of each mooring fixture are noted in Data Table No. 13 and [FIG 3-13](#) in this section. The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. On Berth No. 32, Cleat Nos. B32-C1 and B32-C11 are rated at 4, as these cleats are missing. These fixtures should not be considered in any berthing plan until replacement is complete. All other fittings on Berths 32 and 33 have 1 or 2 ratings.

The fender system on Berth 32 exhibits minor deterioration with repairs required on a non-priority basis. At Berth 33 the fender system exhibits moderate deterioration with repairs required on a priority basis.

B. Berth 34

The existing conditions of each mooring fixture are noted in Data Table No. 13 and [FIG 3-13](#) in this section. The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. All fittings on Berth 34 have 1 or 2 ratings and are considered to be in good condition.

The fender system at Berth 34 is in good condition with a rating of 2. There is some minor deterioration that requires repair on a non-priority basis.

C. Berths 35 and 36

The existing conditions of each mooring fixture are noted in Data Table No. 13 and [FIG 3-13](#) in this section. The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. One fitting, Cleat No. B35-C19 received a No. 4 rating due to spalled concrete on the concrete base. The spalling should be repaired as soon as possible; however, this condition does not affect the load rating of this cleat. All remaining fittings on Berth 35 and 36 have 1 or 2 ratings and are considered to be in good condition.

The fender system at Berths 35 and 36 is in good condition with a rating of 2. There is some minor deterioration that requires repair on a non-priority basis.

An example view of the 3D model may be found on [FIG 3-13A](#).



Photo 3.13-1 Berth 32, fitting B32-C3, Sta. 1+36, 42" type 3 cleat in good condition, #2 rating



Photo 3.13-2 Berth 32, fitting 32-B1, Sta. 2+00, bollard in good condition, #2 rating



Photo 3.13-3 Berth 32, fitting B32-BT2, Sta. 2+96, high double bitt in good condition, #2 rating



Photo3.13-4 Berth 33, fitting B32-C11, Sta. 5+52, cleat is missing grout imprint visible with sheared bolts, #4 rating



Photo3.13-5 Berth 33, fitting B32-C11, Sta. 5+52, close up view of missing cleat base and sheared bolt



Photo 3.13-6 Berth 33, fitting 32-BT4, Sta. 6+80, high double bitt in good condition, #2 rating

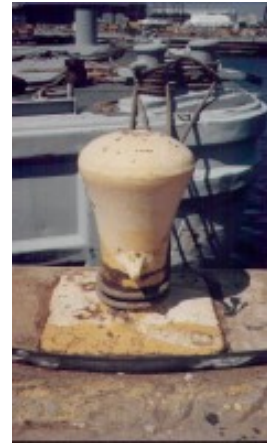


Photo3.13-7 Berth 33, fitting B32-C15, Sta. 7+44, 42" type 3 cleat in good condition, #2 rating



Photo 3.13-8 Berth 33, fitting B32-B4, Sta. 7+76, bollard in good condition, #2 rating



Photo 3.13-9 Berth 33, fitting B32-C17, Sta. 8+40, 42" type 3 cleat with scaling evident on surface of fitting, #2 rating



Photo 3.13-10 Berth 34, fitting B34-B1, Sta. 0+12, bollard in good condition #2 rating





Photo3.13-11 Berth 34, fitting B34-C1 Sta. 0+36, 42"
type 3 cleat in good condition, #2 rating



Photo 3.13-12 Berth 35, fitting B35-B2, Sta. 2+28,
bollard in good condition, #2 rating



Photo 3.13-13 Berth 35, fitting B35-C8, Sta. 3+98, 42"
type 3 cleat in good condition, #2 rating



Photo3.13-14 Berth 35, fitting B35-C9, Sta. 4+52, 42"
type 3 cleat in good condition, #2 rating



Photo 3.13-15 Berth 36, fitting B35-BT3, Sta. 5+13,
high double bitt in good condition, #2 rating



Photo3.13-16 Berth 36, fitting B35-C13, Sta. 6+44, 42"
type 3 cleat in good condition, #2 rating



Photo3.13-17 Berth 36, fitting B35-B5, Sta. 8+04,
bollard in good condition, #2 rating



Photo 3.13-18 Berth 36, fitting B35-BT5. Sta. 9+00,
high double bitt in good condition, #2 rating



Photo 3.13-19 Berth 36, fitting B35-C19, Sta. 4+52, type 3 cleat in good condition, #3 rating



Photo 3.13-20 Berth 36, fitting B35-C19, Sta. 4+52, 42" type 3 cleat, close-up view of damaged concrete edge



Photo3.13-21 Berth 32. fender system with minor deterioration looking south



Photo 3.13-22 Berth 32, fitting B32-C1, Sta. 0+30, 42" type 1 cleat, cleat is missing, rating #4

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO.13-1

BERTH No.32								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
B32-C1	53201	30	1.33	10.89	42"CLEAT,TYPE 1	0	4	2
B32-C2	53202	72	1.33	10.89	42"CLEAT,TYPE 1	20	2	1
B32-BT1	53203	104	2	11.69	HIGH DOUBLE BIT	41	2	2
B32-C3	53204	136	1.5	10.89	42"CLEAT,TYPE 3	20	2	1
B32-C4	53205	168	1.5	10.89	42"CLEAT,TYPE 3	20	2	1
B32-B1	53206	200	2.16	11.69	BOLLARD	50	2	2
B32-C5	53207	232	1.5	10.89	42"CLEAT,TYPE 3	20	2	2
B32-C6	53208	264	1.5	10.89	42"CLEAT,TYPE 3	20	1	1
B32-BT2	53209	296	2	11.69	HIGH DOUBLE BIT	41	2	2
B32-C7	53210	328	1.5	10.89	42"CLEAT,TYPE 3	20	2	1
B32-C8	53211	360	1.5	10.89	42"CLEAT,TYPE 3	20	2	1
B32-B2	53212	392	2.16	11.69	BOLLARD	50	1	2
B32-C9	53213	456	1.5	10.89	42"CLEAT,TYPE 3	20	2	1
B32-BT3	53214	488	2	11.69	HIGH DOUBLE BIT	41	2	2
BERTH 33								
B32-C10	53301	520	1.5	10.89	42"CLEAT,TYPE 3	20	2	1
B32-C11	53302	552	1.5	10.89	42"CLEAT,TYPE 3	0	4	2
B32-B3	53303	586	2.16	11.69	BOLLARD	50	2	2
B32-C12	53304	616	1.5	10.89	42"CLEAT,TYPE 3	20	2	1
B32-C13	53305	648	1.5	10.89	42"CLEAT,TYPE 3	20	2	1

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO.13-2

BERTH No.33 (CONT.)								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
B32-BT4	53306	680	2	11.69	HIGH DOUBLE BIT	41	2	2
B32-C14	53307	712	1.5	10.89	42"CLEAT,TYPE 3	20	2	1
B32-C15	53308	744	1.5	10.89	42"CLEAT,TYPE 3	20	2	2
B32-B4	53309	776	2.16	11.69	BOLLARD	50	2	1
B32-C16	53310	808	1.5	10.89	42"CLEAT,TYPE 3	20	2	1
B32-C17	53311	840	1.5	10.89	42"CLEAT,TYPE 3	20	2	2
B32-BT5	53312	872	2	11.69	HIGH DOUBLE BIT	41	2	2
B32-C18	53313	904	1.5	10.89	42"CLEAT,TYPE 3	20	1	1
B32-C19	53314	936	1.5	10.89	42"CLEAT,TYPE 3	20	2	2
B32-B5	53315	967	2.16	11.69	BOLLARD	50	2	1
BERTH No. 34								
B34-B1	53401	12	12	11.69	BOLLARD	50	1	2
B34-C1	53402	36	1.5	10.19	42"CLEAT,TYPE 3	20	2	1
B34-B2	53403	78	12	11.69	BOLLARD	50	2	2
B34-C2	53404	118	1.5	10.19	42"CLEAT,TYPE 3	20	2	N/A
B34-B3	53405	142	12	11.69	BOLLARD	50	1	1

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO.13-3

BERTH No.35								
FITTING #	NODE #	X	Y	Z	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
		COORD. (Ft)	COORD. (Ft)	COORD. (Ft)			FITTING	BASE
B35-B1	53501	35	2.16	11.69	BOLLARD	50	1	2
B35-C1	53502	68	2	10.19	42"CLEAT,TYPE 3	20	N/A	1
B35-C2	53503	100	2	10.19	42"CLEAT,TYPE 3	20	2	1
B35-BT1	53504	132	2	11.69	HIGH DOUBLE BIT	41	N/A	N/A
B35-C3	53505	164	2	10.19	42"CLEAT,TYPE 3	20	2	N/A
B35-C4	53506	195	2	10.19	42"CLEAT,TYPE 3	20	N/A	1
B35-B2	53507	228	2.16	11.69	BOLLARD	50	1	2
B35-C5	53508	260	2	10.19	42"CLEAT,TYPE 3	20	2	2
B35-C6	53509	293	2	10.19	42"CLEAT,TYPE 3	20	2	1
B35-BT2	53510	325	2	11.69	HIGH DOUBLE BIT	41	2	2
B35-C7	53511	357	2	10.19	42"CLEAT,TYPE 3	20	2	1
B35-C8	53512	398	2	10.19	42"CLEAT,TYPE 3	20	2	1
B35-B3	53513	420	2.16	11.69	BOLLARD	50	1	2
B35-C9	53514	452	2	10.19	42"CLEAT,TYPE 3	20	2	1
B35-C10	53515	484	2	10.19	42"CLEAT,TYPE 3	20	2	1
BERTH No. 36								
B35-BT3	53601	513	2	11.69	HIGH DOUBLE BIT	41	1	2
B35-C11	53602	548	2	10.19	42"CLEAT,TYPE 3	20	2	1
B35-C12	53603	580	2	10.19	42"CLEAT,TYPE 3	20	2	1
B35-B4	53604	612	2.16	11.69	BOLLARD	50	1	2
B35-C13	53605	644	2	10.19	42"CLEAT,TYPE 3	20	2	1
B35-C14	53606	676	2	10.19	42"CLEAT,TYPE 3	20	2	1
B35-BT4	53607	708	2	11.69	HIGH DOUBLE BIT	41	1	2
B35-C15	53608	740	2	10.19	42"CLEAT,TYPE 3	20	2	1
B35-C16	53609	772	2	10.19	42"CLEAT,TYPE 3	20	2	1
B35-B5	53610	804	2.16	11.69	BOLLARD	50	1	2
B35-C17	53611	836	2	10.19	42"CLEAT,TYPE 3	20	2	1
B35-C18	53612	868	2	10.19	42"CLEAT,TYPE 3	20	2	1
B35-BT5	53613	900	2	11.69	HIGH DOUBLE BIT	41	2	2
B35-C19	53614	932	2	10.19	42"CLEAT,TYPE 3	20	2	3
B35-C20	53615	974	2	10.19	42"CLEAT,TYPE 3	20	1	1

CONDITION RATING KEY

- 1 1= EXCELLENT (NEW - NO DAMAGE)
- 2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)
- 3 3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)
- 4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

3.14 INSPECTION OF BERTH 37

3.14.1 Description

Berth 37 was originally constructed in 1938 and consists of a timber pile supported relieving platform which is faced with a reinforced concrete sheetpile bulkhead with concrete seawall. The timber relieving platform is backfilled with soil and covered with a concrete deck. Berth 37 has 350 linear feet of berthing.

Water depths for Berth 37 vary from 26.9 feet to 31.0 feet. The fender system along the face of Berth 37 consists of timber piles with timber chocks and wale. The wale system is bolted directly to the top of the seawall.

3.14.2 Design Structural Capacity

DESIGN STRUCTURAL CAPACITY SUMMARY TABLE			
PIER FACILITY BERTHING AND MOORING ALLOWABLE LOADS *			
FACILITY	DESIGN RATINGS	CALCULATED CAPACITY	
		BERTHING	MOORING
BERTH 37	NONE FOUND	3.46 K/LF	4.58 K/LF
MOORING FIXTURE RATED AND CALCULATED ALLOWABLE LOADS *			
MOORING FIXTURE	QUANTITY	DESIGN RATINGS	CALCULATED RATING
BERTH 37			
42 " TYPE 3 CLEATS	6	20 TONS	N/A
50 TON BOLLARDS	2	50 TONS @ HORIZONTAL 33 TONS @ 45 DEG.	N/A
SINGLE BITT	1	N/A	55 TONS
NOTES :			
* ALLOWABLE LOADS SHOWN ARE BASED ON ASSUMPTIONS . FOR ACTUAL LIVE LOAD LIMITS ADDITIONAL INVESTIGATION IS REQUIRED. SEE APPENDIX FOR COMPUTATIONS.			
N/A - NO INFORMATION AVAILABLE			

3.14.3 Existing Condition

The existing conditions of each mooring fixture are noted in Data Table No. 14 and [FIG 3-14](#) in this section. The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. All fittings on Berth 37 have 1 or 2 ratings and are considered to be in good condition. The timber fender system at Berth 37 is in good condition requiring minor repairs on a non-priority basis.

An example view of the 3D model may be found on [FIG 3-14A](#).



Photo 3.14-1, Berth 37, fitting B37-B1, Sta. 0+03, bitt in good condition, # 1 rating.



Photo 3.14-2, Berth 37, fitting B37-C1, Sta. 0+27, 42" type 3 cleat in good condition, #2 rating.



Photo 3.14-3, Berth 37, fitting B37-B3, Sta. 2+27, bollard in good condition, #2 rating.



Photo 3.14-4, Berth 37, fender system with minor deterioration looking north.

NORFOLK NAVAL SHIPYARD **MOORING CONDITION REPORT**

DATA TABLE NO.14

BERTH No.37								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
B37-B1	53701	3	13.5	11.69	SINGLE BITT	55	1	1
B37-C1	53702	27	1.33	11.19	42"CLEAT,TYPE 3	20	2	1
B37-C2	53703	67	1.33	11.19	42"CLEAT,TYPE 3	20	1	1
B37-B2	53704	107	2.5	12.69	BOLLARD	50	1	1
B37-C3	53705	147	1.33	11.19	42"CLEAT,TYPE 3	20	1	1
B37-C4	53706	187	1.33	11.19	42"CLEAT,TYPE 3	20	1	1
B37-B3	53707	227	2.5	12.69	BOLLARD	50	1	2
B37-C5	53708	267	1.33	11.19	42"CLEAT,TYPE 3	20	1	1
B37-C6	53709	307	1.33	11.19	42"CLEAT,TYPE 3	20	1	1

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

3.15 INSPECTION OF BERTHS 38, 39, AND 40

3.15.1 Description

A. Berths 38 and 39

Berths 38 and 39 were originally constructed in 1943 and consist of a timber pile supported relieving platform which is faced with a reinforced concrete sheet pile bulkhead with concrete seawall. The timber relieving platform is backfilled with soil and covered with a concrete deck. Berths 38 and 39 have 1,000 linear feet of berthing.

Water depths for Berths 38 and 39 vary from 22.7 feet to 37.0 feet. The fender system along the face of Berths 38 and 39 consist of timber piles with timber chocks and wale. The wale system is bolted directly to the top of the seawall.

B. Berth 40

Berth 40 was originally constructed in 1943 and consists of 270 steel H-piles supporting a concrete relieving platform. The platform is 190 feet by 90 feet.

Water depths of Berth 40 vary from 37.8 feet to 44.4 feet. The fender system along the face of Berth 40 consists of timber piles with timber chocks and wale. The wale system is bolted directly to the top of the seawall and sea cushions are used to fend off ships and provide energy absorption.

3.15.2 Design Structural Capacity

DESIGN STRUCTURAL CAPACITY SUMMARY TABLE			
PIER FACILITY BERTHING AND MOORING ALLOWABLE LOADS *			
FACILITY	DESIGN RATINGS	CALCULATED CAPACITY	
		BERTHING	MOORING
BERTHS 38 AND 39	NONE FOUND	3.46 K/LF	4.58K/LF
BERTH 40	NONE FOUND	UNKNOWN	UNKNOWN
MOORING FIXTURE RATED AND CALCULATED ALLOWABLE LOADS *			
MOORING FIXTURE	QUANTITY	DESIGN RATINGS	CALCULATED RATING
BERTHS 38 AND 39			
42 " TYPE 3 CLEATS	20	20 TONS	N/A
LOW DOUBLE BIT	5	61 TONS @HORIZONTAL 37 TONS @ 45 DEG.	N/A N/A
50 TON BOLLARDS	5	50 TONS @HORIZONTAL 33 TONS @ 45 DEG.	N/A N/A
BERTH 40			
42 " TYPE 1 CLEATS	1	20 TONS	N/A
42 " TYPE 3 CLEATS	1	20 TONS	N/A
LOW DOUBLE BIT	2	61 TONS @HORIZONTAL 37 TONS @ 45 DEG.	N/A N/A
* ALLOWABLE LOADS SHOWN ARE BASED ON ASSUMPTIONS . FOR ACTUAL LIVE LOAD LIMITS ADDITIONAL INVESTIGATION IS REQUIRED. SEE APPENDIX FOR COMPUTATIONS.			
N/A - NO INFORMATION AVAILABLE			
** NO BATTER PILES PRESENT ON PIER ALLOWABLE LOADING IS UNKNOWN			

3.15.3 Existing Condition

The existing conditions of each mooring fixture are noted in Data Table No. 15 and [FIG 3-15](#) in this section. The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. All fittings on Berths 38, 39, and 40 have 1 or 2 ratings and are considered to be in good condition.

The fender system at Berths 38 and 39 exhibits minor deterioration and requires repair on a non-priority basis. At the east end of Berth 39 and all of Berth 40, the fender system exhibits moderate deterioration and requires repairs on a priority basis.

An example view of the 3D model may be found on [FIG 3-15A](#).



Photo 3.15-1, Berth 38, fitting B38-C1, Sta. 0+29, 42" type 3 cleat in good condition, #1 rating.



Photo 3.15-2, Berth 38, fitting B38-B1, Sta. 1+89, bollard in good condition, #2 rating.



Photo 3.15-3, Berth 38, fitting B37-BT1, Sta. 0+93, low double bitt in good condition, #1 rating.



Photo 3.15-4, Berth 38, fitting B38-B2, Sta. 3+81, bollard in good condition, #2 rating.



Photo 3.15-5, Berth 38, fitting B38-B2, Sta. 3+81, close-up view of damaged concrete edge.



Photo 3.15-6, Berth 38, fitting B38-BT3, Sta. 4+77, low double bitt in good condition, #2 rating.



Photo 3.15-7, Berth 39, fitting B38-C14, Sta. 6+38, 42" cleat in good condition, #2 rating.



Photo 3.15-8, Berth 38, fitting B38-BT4, Sta. 6+70, low double bitt in good condition, #2 rating.



Photo 3.15-9, Berth 38, fitting B38-B4, Sta. 7+66, bollard in good condition, #2 rating.



Photo 3.15-10, Berth 38, fitting B38-B4, Sta. 7+66 , close up view of damaged concrete edge.



Photo 3.15-11, Berth 40, fitting B40-BT2, Sta. 0+41, low double bitt in good condition, #2 rating.



Photo 3.15-12, Berth 40, fitting B40-C2, Sta. 1+16, 42" type 1 cleat in good condition, #2 rating.



Photo 3.15-13, Berth 39, fender system with moderate deterioration looking east.

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 15-1

BERTH No. 38								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
B38-C1	53801	29	1.33	10.19	42"CLEAT,TYPE 3	20	1	1
B38-C2	53802	62	1.33	10.19	42"CLEAT,TYPE 3	20	2	2
B38-BT1	53803	93	2	11.69	LOW DOUBLE BIT	61	1	1
B38-C3	53804	125	1.33	10.19	42"CLEAT,TYPE 3	20	2	2
B38-C4	53805	157	1.33	10.19	42"CLEAT,TYPE 3	20	2	1
B38-B1	53806	189	2.33	11.69	BOLLARD	50	1	2
B38-C5	53807	222	1.33	10.19	42"CLEAT,TYPE 3	20	2	1
B38-C6	53808	252	1.33	10.19	42"CLEAT,TYPE 3	20	2	1
B38-BT2	53809	285	2	11.69	LOW DOUBLE BIT	61	2	1
B38-C7	53810	317	1.33	10.19	42"CLEAT,TYPE 3	20	2	1
B38-C8	53811	349	1.33	10.19	42"CLEAT,TYPE 3	20	2	1
B38-B2	53812	381	2.33	11.69	BOLLARD	50	1	2
B38-C9	53813	413	1.33	10.19	42"CLEAT,TYPE 3	20	2	1
B38-C10	53814	445	1.33	10.19	42"CLEAT,TYPE 3	20	2	1
B38-BT3	53815	477	2	11.69	LOW DOUBLE BIT	61	2	1
BERTH No. 39								
B38-C11	53901	510	1.33	10.19	42"CLEAT,TYPE 3	20	2	1
B38-C12	53902	541	1.33	10.19	42"CLEAT,TYPE 3	20	2	1
B38-B3	53903	573	2.33	11.69	BOLLARD	50	1	2
B38-C13	53904	606	1.33	10.19	42"CLEAT,TYPE 3	20	2	1
B38-C14	53905	638	1.33	10.19	42"CLEAT,TYPE 3	20	2	2
B38-BT4	53906	670	2	11.69	LOW DOUBLE BIT	61	2	1
B38-C15	53907	702	1.33	10.19	42"CLEAT,TYPE 3	20	2	1
B38-C16	53908	734	1.33	10.19	42"CLEAT,TYPE 3	20	2	1
B38-B4	53909	766	2.33	11.69	BOLLARD	50	2	2
B38-C17	53910	797	1.33	10.19	42"CLEAT,TYPE 3	20	2	1
B38-C18	53911	830	1.33	10.19	42"CLEAT,TYPE 3	20	2	1
B38-BT5	53912	862	2	11.69	LOW DOUBLE BIT	61	2	1
B38-C19	53913	895	1.33	10.19	42"CLEAT,TYPE 3	20	2	2
B38-C20	53914	928	1.33	10.19	42"CLEAT,TYPE 3	20	2	2
B38-B5	53915	961	2.33	11.69	BOLLARD	50	2	2

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO.15-2

BERTH No.40								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
B40-C1	54001	47	3.5	10.19	42"CLEAT,TYPE 3	20	2	1
B40-C2	54002	116	11.5	10.19	42"CLEAT,TYPE 1	20	2	N/A
B40-BT1	54003	6	2	11.69	LOW DOUBLE BIT	61	2	1
B40-BT2	54004	41	4	11.69	LOW DOUBLE BIT	61	2	1

CONDITION RATING KEY

1

1= EXCELLENT (NEW - NO DAMAGE)

2

2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3

3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4

4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

3.16 INSPECTION OF BERTHS 41, 42, AND 43

3.16.1 Description

A. Berth 41

Berth 41 was originally constructed in 1943 and consists of 343 steel H-piles supporting a reinforced concrete deck. Berth 41 has approximately 120 LF of berthing.

Water depths for Berth 41 vary from 33.4 feet to 43.4 feet. The fender system along the face of Berth 41 consists of timber piles with timber chocks and wale. The wale system is bolted directly to the top of the seawall and sea cushions are used to fend off ships and provide energy absorption.

B. Berths 42 and 43

Berths 42 and 43 were originally built in 1942. They were constructed with timber relieving platforms supported by timber piles. The platforms are faced with reinforced concrete sheetpiling. The concrete sheetpiling for both berths are capped with a concrete seawall and are backfilled with soil. The fill is covered with a concrete deck at the same elevation as the top of the concrete seawall. Berth 42 has 800 linear feet of berthing and Berth 43 has 687 linear feet of berthing. The water depth ranged from approximately 22 feet at Berth 43 to approximately 38 feet at Berth 42.

3.16.2 Design Structural Capacity

DESIGN STRUCTURAL CAPACITY SUMMARY TABLE			
PIER FACILITY BERTHING AND MOORING ALLOWABLE LOADS *			
FACILITY	DESIGN RATINGS	CALCULATED CAPACITY	
		BERTHING	MOORING
BERTH 41	NONE FOUND	UNKNOWN	UNKNOWN
BERTHS 42 AND 43	NONE FOUND	3.48 K/LF	4.58K/LF
MOORING FIXTURE RATED AND CALCULATED ALLOWABLE LOADS *			
MOORING FIXTURE	QUANTITY	DESIGN RATINGS	CALCULATED RATING
BERTH 41			
42 " TYPE 3 CLEATS	1	20 TONS	N/A
30" CLEAT	2	10TONS	N/A
BERTHS 42 AND 43			
30" CLEATS	3	10 TONS	N/A
42 " TYPE 3 CLEATS	25	20 TONS	N/A
50 TON BOLLARDS	6	50 TONS @HORIZONTAL 33 TONS @ 45 DEG.	N/A N/A
SINGLE BITT	1	N/A	55 TONS
LOW DOUBLE BIT	8	81 TONS @HORIZONTAL 37 TONS @ 45 DEG.	N/A N/A
* ALLOWABLE LOADS SHOWN ARE BASED ON ASSUMPTIONS . FOR ACTUAL LIVE LOAD LIMITS ADDITIONAL INVESTIGATION IS REQUIRED. SEE APPENDIX FOR COMPUTATIONS.			
N/A - NO INFORMATION AVAILABLE			
** NO BATTER PILES PRESENT ON PIER ALLOWABLE LOADING IS UNKNOWN			

3.16.3 Existing Condition

The existing conditions of each mooring fixture are noted in Data Table No. 16 and [FIG 3-16](#) in this section. The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. All fittings on Berths 41, 42, and 43 have 1 or 2 ratings and are considered to be in good condition.

An example view of the 3D model may be found on [FIG 3-16A](#).

The timber pile fender system at Berth 41 is in good condition requiring minor repairs on a non-priority basis. The timber pile fender system on Berths 42 and 43 is in extremely poor condition requiring extensive repairs and/or replacement on a priority basis. Use of this fender system should be restricted until repairs are undertaken.



Photo 3.16-1, Berth 41, fitting B41-C1, Sta. 0+08, 42" type 3 cleat in good condition, #2 rating.



Photo 3.16-2, Berth 41, fitting B41-C2, Sta. 0+32, 30" cleat in good condition, #2 rating.



Photo 3.16-3, Berth 42, fitting B42-BT1, Sta. 0+17, low double bitt in good condition with scaling of the fitting base, #2 rating.



Photo 3.16-4, Berth 42, fitting B42-B1, Sta. 1+36, bollard in good condition, #1 rating.



Photo 3.16-5, Berth 42, fitting B42-C4, Sta. 2+00, 42" type 3 cleat in good condition, #2 rating.



Photo 3.16-6, Berth 42, fitting B42-BT4, Sta. 4+25, low double bitt in good condition, #2 rating.



Photo 3.16-7, Berth 42, fitting B42-BT4, Sta. 4+25, low double bitt, close-up view of damaged concrete edge.



Photo 3.16-8, Berth 42, fitting B42-C11, Sta. 5+86, 42" type 3 cleat in good condition, #2 rating.



Photo 3.16-9, Berth 42, fitting B42-BT5, Sta. 6+19, low double bitt in good condition, #2 rating.



Photo 3.16-10, Berth 43, fitting B42-C20, Sta. 10+36, 42" type 3 cleat in good condition, #2 rating.



Photo 3.16-11, Berth 43, fitting B42-BT8, Sta. 11+96, low double bitt in good condition, #2 rating.



Photo 3.16-12, Berth 43, fitting B42-B7, Sta. 12+65, single bitt in good condition, #1 rating.



Photo 3.16-13, Berth 43, fitting B42-C27, Sta. 13+25, 30" cleat in good condition, #2 rating.



Photo 3.16-14, Berth 43, fitting B42-C28, Sta. 13+54, 30" cleat in good condition, #1 rating.



Photo 3.16-15, Berth 42, fender system with severe deterioration looking east.



Photo 3.16-16, Berth 43, fender system with minor deterioration looking west.



NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 16-1

BERTH No.41								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL* (TONS)	CONDITION OF FITTING	
							FITTING	BASE
B41-C1	54101	8	1.5	10.19	42"CLEAT,TYPE S	20	2	1
B41-C2	54102	92	1	10.19	30"CLEAT	10	2	1
B41-C8	54103	56	1	10.19	30"CLEAT	10	2	2
BERTH No. 42								
B42-BT1	54201	17	1.5	10.19	LOW DOUBLE BIT	61	2	2
B42-BT2	54202	40	1.5	11.69	LOW DOUBLE BIT	61	2	2
B42-C1	54203	71	1.5	10.19	42"CLEAT,TYPE S	20	2	1
B42-C2	54204	100	1.5	10.19	42"CLEAT,TYPE S	20	2	1
B42-B1	54205	136	2	11.69	BOLLARD	50	1	1
B42-C3	54206	169	1.5	10.19	42"CLEAT,TYPE S	20	2	2
B42-C4	54207	200	1.5	10.19	42"CLEAT,TYPE S	20	2	1
B42-BT3	54209	232	1.5	11.69	LOW DOUBLE BIT	61	2	2
B42-C5	54203	263	1.5	10.19	42"CLEAT,TYPE S	20	2	2
B42-C6	54210	297	1.5	10.19	42"CLEAT,TYPE S	20	2	2
B42-B2	54211	329	2	11.69	BOLLARD	50	1	2
B42-C7	54212	361	1.5	10.19	42"CLEAT,TYPE S	20	2	2
B42-C8	54213	393	1.5	10.19	42"CLEAT,TYPE S	20	2	2
B42-BT4	54214	425	1.5	11.69	LOW DOUBLE BIT	61	2	2
B42-C9	54215	457	1.5	10.19	42"CLEAT,TYPE S	20	2	2
B42-B3	54216	522	2	11.69	BOLLARD	50	1	2
B42-C10	54217	554	1.5	10.19	42"CLEAT,TYPE S	20	2	2
B42-C11	54219	586	1.5	10.19	42"CLEAT,TYPE S	20	2	2
B42-BT5	54219	619	1.5	11.69	LOW DOUBLE BIT	61	2	2

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION , SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO.16-2

BERTH No.43								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
B42-C12	54301	651	1.5	10.19	42"CLEAT,TYPE S	20	2	2
B42-C13	54302	682	1.5	10.19	42"CLEAT,TYPE S	20	2	2
B42-B4	54303	715	2	11.89	BOLLARD	50	1	2
B42-C14	54304	747	1.5	10.19	42"CLEAT,TYPE S	20	2	2
B42-C15	54305	778	1.5	10.19	42"CLEAT,TYPE S	20	2	2
B42-ET6	54306	811	1.5	11.89	LOW DOUBLE BIT	61	2	1
B42-C16	54307	843	1.5	10.19	42"CLEAT,TYPE S	20	2	2
B42-C17	54308	875	1.5	10.19	42"CLEAT,TYPE S	20	2	1
B42-B5	54309	907	2	11.89	BOLLARD	50	1	2
B42-C18	54310	940	1.5	10.19	42"CLEAT,TYPE S	20	2	2
B42-C19	54311	972	1.5	10.19	42"CLEAT,TYPE S	20	2	2
B42-ET7	54312	1004	1.5	11.89	LOW DOUBLE BIT	61	2	1
B42-C20	54313	1036	1.5	10.19	42"CLEAT,TYPE S	20	2	2
B42-C21	54314	1068	1.5	10.19	42"CLEAT,TYPE S	20	2	2
B42-B6	54315	1100	2	11.89	BOLLARD	50	1	2
B42-C22	54316	1132	1.5	10.19	42"CLEAT,TYPE S	20	2	2
B42-C23	54317	1164	1.5	10.19	42"CLEAT,TYPE S	20	2	1
B42-ET8	54318	1196	1.5	11.89	LOW DOUBLE BIT	61	1	2
B42-C24	54319	1229	1.5	10.19	42"CLEAT,TYPE S	20	2	2
B42-C25	54320	1261	1.5	10.19	42"CLEAT,TYPE S	20	2	1
B42-B7	54321	1295	4	11.89	SINGLE BIT	55	1	1
B42-C26	54322	1326	1	10.19	50"CLEAT	10	2	2
B42-C27	54323	1357	5	10.19	50"CLEAT	10	2	1
B42-C28	54324	1354	2	10.19	50"CLEAT	10	1	1

CONDITION RATING KEY

- 1 1= EXCELLENT (NEW - NO DAMAGE)
- 2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)
- 3 3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)
- 4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

3.17 INSPECTION OF DRY DOCK NO.1

3.17.1 Description

Dry Dock No. 1 was originally constructed in 1833 and consists of reinforced concrete gravity walls with timber piles supporting the wall. The dry dock's width is 60 feet and overall length is 330 feet.

3.17.2 Design Structural Capacity

DESIGN STRUCTURAL CAPACITY SUMMARY TABLE			
PIER FACILITY BERTHING AND MOORING ALLOWABLE LOADS *			
FACILITY	DESIGN RATINGS	CALCULATED CAPACITY	
		BERTHING	MOORING
DRY DOCK 1	NONE FOUND	UNKNOWN	UNKNOWN
MOORING FIXTURE RATED AND CALCULATED ALLOWABLE LOADS *			
MOORING FIXTURE	QUANTITY	DESIGN RATINGS	CALCULATED RATING
40" CLEAT	2	UNKNOWN	N/A
26" CLEAT	20	UNKNOWN	12TONS
12" DIA. PIPE	4	UNKNOWN	N/A
CANNON	4	UNKNOWN	N/A
WINDLASS	6	UNKNOWN	6 TONS @ HORIZONTAL
CAPSTAN	2	VARIES - SEE TABLE	N/A
* ALLOWABLE LOADS SHOWN ARE BASED ON ASSUMPTIONS . FOR ACTUAL LIVE LOAD LIMITS ADDITIONAL INVESTIGATION IS REQUIRED. SEE APPENDIX FOR COMPUTATIONS. N/A - NO INFORMATION AVAILABLE - INSUFFICIENT DATA FOR CALCULATIONS			

3.17.3 Existing Condition

The existing conditions of each mooring fixture are noted in Data Table No. 17 and [FIG 3-17](#) in this section. The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. At Dry Dock No. 1 there is one fitting that has a No. 4 rating, DD1P-B1, which is a 12-inch diameter pipe with the top sheared off. This fitting should not be used until a replacement has been installed. There is one fitting that has a No. 3 rating, DD1P-CP3, which is a windless that has a crack on the fitting's base. This condition should be monitored under load to determine whether the crack is active or stable. All other fittings on Dry Dock No. 1 have 1 or 2 ratings and are considered to be in good condition.



Photo 3.17-1, Dry Dock 1, fitting DD1S-C1, 40" cleat in good condition, # 1 rating.



Photo 3.17-2, Dry Dock 1, fitting DD1S-B2, 12" dia pipe in good condition, # 1 rating.



Photo 3.17-3, Dry Dock 1, fitting DD1S-C4, 26" cleat in good condition, # 2 rating due to minor cracking of granite base.



Photo 3.17-4, Dry Dock 1, fitting DD1S-C4, 26" cleat close-up view of cracking at base.



Photo 3.17-5, Dry Dock 1, fitting DD1S-CP1, windlass in good condition with # 2 rating.

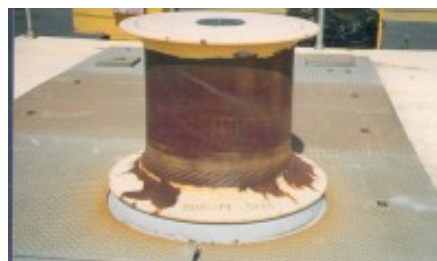


Photo 3.17-6, Dry Dock 1, fitting DD1S-CP4, capstan in good condition.



Photo 3.17-7, Dry Dock 1, fitting B13-B2, cannon barrel in good condition.



Photo 3.17-8, Dry Dock 1, fitting DD1P-C1, 40 "cleat in good condition, # 1 rating.

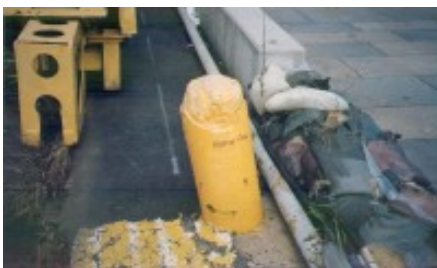


Photo 3.17-9, Dry Dock 1, fitting DD1P-B1, 12" pipe with top sheared off, # 4 rating.



Photo 3.17-10, Dry Dock 1, fitting DD1P-B2, pipe in good condition, # 1 rating.



Photo 3.17-11 Dry Dock 1, fitting DDIP-CP3, windlass crack noted on fitting base, #3 rating.

NORFOLK NAVAL SHIPYARD **MOORING CONDITION REPORT**

DATA TABLE NO. 17-1

DRY DOCK No. 1-STARBOARD SIDE								
FITTING #	NODE #	X COORD.	Y COORD.	Z COORD.	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
DD1S-C1	60101	19	38.5	100	40" CLEAT	UNKNOWN	1	1
DD1S-B1	60102	23	55	102.8	12" DIA PIPE	UNKNOWN	1	1
DD1S-C2	60103	39	39	100	26"CLEAT	12	2	1
DD1S-CP1	60104	53	52	103.25	WINDLASS	UNKNOWN	2	1
DD1S-C3	60105	65	38	100	26"CLEAT	12	1	1
DD1S-B2	60106	74	38	103.3	12" DIA PIPE	UNKNOWN	1	1
DD1S-C4	60108	112.5	44.6	100	26"CLEAT	12	1	2
DD1S-CP2	60109	160	51.5	102.5	WINDLASS	UNKNOWN	2	NA
DD1S-C5	60110	161	45.5	100	26"CLEAT	12	1	1
DD1S-C6	60107	205.5	45.5	100	26"CLEAT	12	1	1
DD1S-C7	60111	249	45.5	100	26"CLEAT	12	1	1
DD1S-CP3	60112	281	51.5	103.3	WINDLASS	UNKNOWN	1	2
DD1S-C8	60113	278	45.5	100	26"CLEAT	12	1	1
DD1S-C9	60114	308	45.5	100	26"CLEAT	12	1	1
DD1S-C11	60115	330	14	100	26"CLEAT	12	1	1
DD1S-C10	60116	333	39	100	26"CLEAT	12	1	1
DD1S-CP4	60117	351.5	1	103.6	CAPSTAN	UNKNOWN	NA	NA

CONDITION RATING KEY

1

1= EXCELLENT (NEW - NO DAMAGE)

2

2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3

3 = MARGINAL (SIGNIFICANT CORROSION, SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4

4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 17-2

DRY DOCK No. 1-PORT SIDE								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
DD1P-C1	60201	19	37	100	40" CLEAT	100	1	1
DD1P-B1	60202	24	58.5	NA	12" DIA PIPE	0	4	1
DD1P-C2	60203	40	38	100	26"CLEAT	12	2	1
DD1P-C3	60204	65.5	37	100	26"CLEAT	12	1	1
DD1P-B2	60205	74	37	103.25	12" DIA PIPE	UNKNOWN	1	1
DD1P-CP1	60206	94	98	104	CAPSTAN	UNKNOWN	1	1
DD1P-C4	60207	113	44	100	26"CLEAT	12	1	1
DD1P-CP2	60208	118	52	102.75	WINDLASS	UNKNOWN	1	1
DD1P-B3	60209	119	88	103.3	CANNON	UNKNOWN	1	1
DD1P-C5	60210	161.5	43.5	100	26"CLEAT	12	1	1
DD1P-B4	60211	197	87	103.1	CANNON	UNKNOWN	1	1
DD1P-C6	60212	205	43.5	100	26"CLEAT	12	1	1
DD1P-CP3	60213	214.5	52	102.6	WINDLASS	UNKNOWN	3	1
DD1P-C7	60214	250	44	100	26"CLEAT	12	1	1
DD1P-B5	60215	264	87	103.1	CANNON	UNKNOWN	1	1
DD1P-C8	60216	278	44	100	26"CLEAT	12	1	1
DD1P-C9	60217	306.5	39	100	26"CLEAT	12	1	1
DD1P-B6	60218	330	82	103.1	CANNON	UNKNOWN	1	1
DD1P-CP4	60219	328	52	102.75	WINDLASS	UNKNOWN	1	NA
DD1P-C11	60220	330	13	100	26"CLEAT	12	1	1
DD1P-C10	60221	333	38.5	100	26"CLEAT	12	1	1

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION, SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

3.18 DRY DOCK NO. 2

3.18.1 Description

Dry Dock No. 2 was originally constructed in 1903 and consists of reinforced concrete gravity walls with timber piles supporting the wall. The dry dock's width is 97 feet and overall length is 513 feet.

3.18.2 Design Structural Capacity

DESIGN STRUCTURAL CAPACITY SUMMARY TABLE			
PIER FACILITY BERTHING AND MOORING ALLOWABLE LOADS *			
FACILITY	DESIGN RATINGS	CALCULATED CAPACITY	
		BERTHING	MOORING
DRY DOCK 2	NONE FOUND	UNKNOWN	UNKNOWN
MOORING FIXTURE RATED AND CALCULATED ALLOWABLE LOADS *			
MOORING FIXTURE	QUANTITY	DESIGN RATINGS	CALCULATED RATING
42" TYPE 2 CLEAT	30	20 TONS	N/A
42" TYPE 1 CLEAT	1	20 TONS	N/A
30" CLEAT	9	UNKNOWN	10TONS
CANNON	5	UNKNOWN	N/A
WINDLASS	5	UNKNOWN	6 TONS @ HORIZONTAL
CAPSTAN	4	VARIES - SEE TABLE	N/A
* ALLOWABLE LOADS SHOWN ARE BASED ON ASSUMPTIONS . FOR ACTUAL LIVE LOAD LIMITS ADDITIONAL INVESTIGATION IS REQUIRED. SEE APPENDIX FOR COMPUTATIONS.			
N/A - NO INFORMATION AVAILABLE - INSUFFICIENT DATA FOR CALCULATIONS			

3.18.3 Existing Condition

The existing conditions of each mooring fixture are noted in Data Table No. 18 and [FIG 3-18](#) in this section. The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. Dry Dock No. 2 has two cleats, DD2P-C7 and DD2P-C10 that have received a No. 4 rating. Cleat DD2P-C7 has failed at the concrete base and cleat DD2P-C10 is missing. These cleats should be repaired or replaced in-kind prior to consideration in any berthing plan. Fitting DD2S-B1 (Cannon) also has a No. 4 rating due to noticeable displacement most likely the result of overloading. Cleats DD2S-C6, DD2S-C7, DD2S-C7A, DD2S-C10, DD2S-C11, DD2P-C11, and DD2P-C13 all have received a No. 3 rating due to grout missing at the base and evidence of corrosion of the anchor bolts. These cleats should have their anchor bolts inspected (visually) for loss of section. If there is minimal loss, the cleats should be reset in grout and the bolt pockets filled with lead. All other fittings on Dry Dock No. 2 have 1 or 2 ratings and are considered to be in good condition.



Photo 3.18-1, Dry Dock 2, fitting DD2S-C3, 42" type 2 cleat in good condition, #1 rating.



Photo 3.18-2, Dry Dock 2, fitting DD2S-C2, 42" type 2 cleat in good condition, #1 rating.



Photo 3.18-3, Dry Dock 2, fitting DD2S-C19, 30" cleat in good condition, # 1 rating.



Photo 3.18-4, Dry Dock 2, fitting DD2S-CP4, windlass in good condition, # 1 rating.



Photo 3.18-5, Dry Dock 2, fitting DD2S-CP2, capstan in good condition, # 1 rating.



Photo 3.18-6, Dry Dock 2, fitting DD2S-B1, cannon barrel showing displacement, # 4 rating.



Photo 3.18-7, Dry Dock 2, fitting DD2S-C6, 42" type 2 cleat with ungrouted base and bolt pockets unfilled, # 3 rating due to evidence of corrosion on bolts.



Photo 3.18-8, Dry Dock 2, fitting DD2S-C6, close up of cleat showing bolt pocket and base.



Photo 3.18-9, Dry Dock 2, fitting DD2P-C4, 42" type 2 cleat in good condition, # 1 rating.



Photo 3.18-10, Dry Dock 2, fitting DD2P-C7, 42" type 2 cleat exhibits corrosion of base and bolts, # 4 rating.



Photo 3.18-11, Dry Dock 2, fitting DD2P-C7, 42" type 2 cleat exhibiting cracking of the concrete base.



Photo 3.18-12, Dry Dock 2, fitting DD2P-C10, cleat missing with anchor bolts exposed, # 4 rating.



Photo 3.18-13, Dry Dock 2, fitting DD2P-C11, 42" type 2 cleat without grout at base and unfilled bolt pockets, corrosion is evident on bolts, # 3 rating.



Photo 3.18-14, Dry Dock 2, fitting DD2S-C14, 42" type 1 cleat in good condition, # 2 rating.



Photo 3.18-15, Dry Dock 2, fitting DD2S-C7, Sta. 1+65, 42" Type 2 cleat, ungrouted base and bolt pockets not filled, #3 rating.



Photo 3.18-16, Dry Dock 2, fitting DD2S-C10, Sta. 2+64, 42" Type 2 cleat, ungrouted base and bolt pockets not filled, #3 rating.



Photo 3.18-17, Dry Dock 2, fitting DD2S-C11, Sta. 2+91, 42" Type 2 cleat, ungrouted base and bolt pockets not filled, #3 rating.



Photo 3.18-18, Dry Dock 2, fitting DD2P-C13, Sta. 3+20, 42" Type 2 cleat, ungrouted base and bolts pockets not filled, #3 rating.

Photo 3.18-19, Dry Dock 2, fitting DD2P-C12, Sta. 2+94, 42" Type 2 cleat, ungrouted base and bolt pockets not filled, #3 rating.



NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 18-1

DRY DOCK No. 2-STARBOARD SIDE								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
DD2S-C1	60301	15	54	103	42" CLEAT TYPE 2	20	2	2
DD2S-C2	60302	40	54	103	42" CLEAT TYPE 2	20	2	2
DD2S-C3	60303	67	55	103	42" CLEAT TYPE 2	20	1	1
DD2S-C4	60304	88.5	55	103	42" CLEAT TYPE 2	20	1	1
DD2S-C5	60305	114	55	103	42" CLEAT TYPE 2	20	1	1
DD2S-C6	60306	144	55	103	42" CLEAT TYPE 2	20	3	1
DD2S-B1	60307	172	110	106.5	CANNON	UNKNOWN	3	4
DD2S-CP1	60308	179	103.4	106.25	WINDLASS	UNKNOWN	1	1
DD2S-C7	60309	165	55	103	42" CLEAT TYPE 2	20	3	1
DD2S-C8	60310	211	55	103	42" CLEAT TYPE 2	20	1	1
DD2S-CP2	60311	223	133.4	107	CAPSTAN	UNKNOWN	1	1
DD2S-C9	60312	235	55	103	42" CLEAT TYPE 2	20	1	1
DD2S-B2	60313	245	109.4	105.75	CANNON	UNKNOWN	1	1
DD2S-C10	60314	264	55	103	42" CLEAT TYPE 2	20	3	1
DD2S-C11	60315	291	55	103	42" CLEAT TYPE 2	20	3	1
DD2S-CP3	60316	316	98.4	106.17	WINDLASS	UNKNOWN	1	1
DD2S-C12	60317	317	55	103	42" CLEAT TYPE 2	20	1	2
DD2S-B3	60318	323	109	105.83	CANNON	UNKNOWN	1	1
DD2S-C13	60319	347	55	103	42" CLEAT TYPE 2	20	1	1
DD2S-B4	60320	373	109	106.33	CANNON	UNKNOWN	1	1
DD2S-C14	60321	373	55	103	42" CLEAT TYPE 1	20	2	2
DD2S-CP4	60322	400	108	106.17	WINDLASS	UNKNOWN	1	1
DD2S-C15	60323	408	55	103	30" CLEAT	10	1	1
DD2S-B5	60324	414.5	111	106	CANNON	UNKNOWN	1	1
DD2S-C16	60325	442	55	103	30" CLEAT	10	1	1
DD2S-C17	60326	470.5	55	103	30" CLEAT	10	1	1
DD2S-C18	60327	496	55	103	30" CLEAT	10	1	1
DD2S-C19	60328	513.5	17	103	30" CLEAT	10	1	1

CONDITION RATING KEY

1	1= EXCELLENT (NEW - NO DAMAGE)
2	2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)
3	3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)
4	4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 18-2

DRY DOCK No. 2-PORT SIDE								
FITTING #	NODE #	X	Y	Z	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
		COORD. (Ft)	COORD. (Ft)	COORD. (Ft)			FITTING	BASE
DD2P-CP1	60401	-5	105	106.25	CAPSTAN	UNKNOWN	1	1
DD2P-C1	60402	12	50	103	42" CLEAT TYPE 2	20	1	2
DD2P-C2	60403	37	50	103	42" CLEAT TYPE 2	20	1	2
DD2P-C3	60404	65	48	103	42" CLEAT TYPE 2	20	1	1
DD2P-C4	60405	90	48	103	42" CLEAT TYPE 2	20	1	1
DD2P-C5	60406	118	48	103	42" CLEAT TYPE 2	20	1	2
DD2P-C6	60407	143	53	103	42" CLEAT TYPE 2	20	1	1
DD2P-CP2	60408	160	93.6	107	CAPSTAN	UNKNOWN	1	1
DD2P-CP3	60409	162	72.6	106.25	WINDLASS	UNKNOWN	2	1
DD2P-C7	60410	176	53	103	42" CLEAT TYPE 2	20	4	4
DD2P-C8	60411	195	53	103	42" CLEAT TYPE 2	20	1	1
DD2P-C9	60412	217	53	103	42" CLEAT TYPE 2	20	1	1
DD2P-C10	60413	245	53	103	42" CLEAT TYPE 2	20	4	4
DD2P-C11	60414	269	53	103	42" CLEAT TYPE 2	20	3	3
DD2P-CP4	60415	286	72.6	106.25	WINDLASS	UNKNOWN	2	1
DD2P-C12	60416	294	53	103	42" CLEAT TYPE 2	20	3	3
DD2P-C13	60417	320	53	103	42" CLEAT TYPE 2	20	3	3
DD2P-C14	60418	347	53	103	42" CLEAT TYPE 2	20	1	2
DD2P-C15	60419	373	53	103	42" CLEAT TYPE 2	20	1	2
DD2P-C16	60420	407.0	53	103	42" CLEAT TYPE 2	20	1	2
DD2P-CP5	60421	423.0	109.6	106.42	CAPSTAN	UNKNOWN	1	1
DD2P-C17	60422	440	53	103	30" CLEAT	10	1	2
DD2P-C18	60423	473	53	103	30" CLEAT	10	1	1
DD2P-C19	60424	495.5	36.8	103	30" CLEAT	10	1	1
DD2P-C20	60425	513.5	16	103	30" CLEAT	10	1	1

CONDITION RATING KEY



1= EXCELLENT (NEW - NO DAMAGE)



2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)



3 = MARGINAL (SIGNIFICANT CORROSION, SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)



4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)



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3.19 DRY DOCK NO. 3

3.19.1 Description

Dry Dock No. 3 was originally constructed in 1911 and consists of reinforced concrete gravity walls with timber piles supporting the wall. The dry dock's clear width is 128 feet and clear length is 698 feet.

3.19.2 Design Structural Capacity

DESIGN STRUCTURAL CAPACITY SUMMARY TABLE			
PIER FACILITY BERTHING AND MOORING ALLOWABLE LOADS *			
FACILITY	DESIGN RATINGS	CALCULATED CAPACITY	
		BERTHING	MOORING
DRY DOCK 3	NONE FOUND	UNKNOWN	UNKNOWN
MOORING FIXTURE RATED AND CALCULATED ALLOWABLE LOADS *			
MOORING FIXTURE	QUANTITY	DESIGN RATINGS	CALCULATED RATING
42" TYPE 2 CLEAT	36	20 TONS	N/A
SINGLE BITT	18	UNKNOWN	55 TONS
SM BOLLARD	2	UNKNOWN	N/A
WINDLASS	2	UNKNOWN	6 TONS @ HORIZONTAL
CAPSTAN	8	VARIES - SEE TABLE	N/A
* ALLOWABLE LOADS SHOWN ARE BASED ON ASSUMPTIONS . FOR ACTUAL LIVE LOAD LIMITS ADDITIONAL INVESTIGATION IS REQUIRED. SEE APPENDIX FOR COMPUTATIONS. N/A - NO INFORMATION AVAILABLE - INSUFFICIENT DATA FOR CALCULATIONS			

3.19.3 Existing Condition

The existing conditions of each mooring fixture are noted in Data Table No. 19 and [FIG 3-19](#) in this section. The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. At Dry Dock No. 3, two cleats, DD3S-C8 and DD3P-C8 have received a No 3 rating as a result of missing grout under the cleat base and unfilled bolt pockets allowing the anchor bolts to corrode. These cleats should be removed and the anchor bolts inspected for section loss. If there is minimal section loss of the bolts, the cleats should be reinstalled and set in a grout bed and the bolt pockets should be filled with lead. All other fittings on Dry Dock No. 3 have 1 or 2 ratings and are considered to be in good condition.



Photo 3.19-1, Dry Dock 3, fitting DD3S-CP5, windlass in good condition, #2 rating.



Photo 3.19-2, Dry Dock 3, fitting DD3S-C5, 42" type 1 cleat in good condition, #1 rating.



Photo 3.19-3, Dry Dock 3, fitting DD3S-C14, 42" type 1 cleat in good condition, # 1 rating.



Photo 3.19-4, Dry Dock 3, fitting DD3S-CP7, capstan in good condition, # 1 rating.



Photo 3.19-5, Dry Dock 3, fitting DD3S-B11, single bitt in good condition, #1 rating.



Photo 3.19-6, Dry Dock 3, fitting DD3P-C7, 42" type 1 cleat close up showing concrete base, minor map cracking is evident, #1 rating.



Photo 3.19-7, Dry Dock 3, fitting DD3P-B7, small bollard in good condition, #1 rating.



Photo 3.19-8, Dry Dock 3, fitting DD3S-C8, Sta. 2+90, 42" Type 1 cleat, ungrouted base and bolt pockets not filled, #3 rating.



Photo 3.19-9, Dry Dock 3, fitting DD3P-C8, Sta. 3+00, 42" Type 1 cleat, ungrouted base and bolt pockets not filled, #3 rating.

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 19-1

DRY DOCK No. 3-STARBOARD SIDE								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
DD3S-CP1	60501	1	101	104.5	CAPSTAN	UNKNOWN	1	1
DD3S-CP2	60502	5	125	104.6	WINDLASS	UNKNOWN	2	1
DD3S-C1	60503	10	58	103.45	42" CLEAT TYPE 1	20	2	1
DD3S-C2	60504	34	57	103.45	42" CLEAT TYPE 1	20	1	1
DD3S-C3	60505	61	65	103.45	42" CLEAT TYPE 1	20	1	1
DD3S-B1	60506	94	100	103.4	SINGLE BITT	55	1	NA
DD3S-C4	60507	102	65	103.45	42" CLEAT TYPE 1	20	1	V
DD3S-B2	60508	125	100	102.7	SINGLE BITT	55	1	NA
DD3S-C5	60509	144	65	103.45	42" CLEAT TYPE 1	20	1	1
DD3S-B3	60510	158	100	102.7	SINGLE BITT	55	1	NA
DD3S-CP3	60511	189	101	104.7	CAPSTAN	UNKNOWN	1	1
DD3S-C6	60512	195	65	103.45	42" CLEAT TYPE 1	20	1	1
DD3S-B4	60513	220	100	102.7	SINGLE BITT	55	1	NA
DD3S-C7	60514	244	65	103.45	42" CLEAT, TYPE 1	20	1	1
DD3S-B5	60515	252	100	102.7	SINGLE BITT	55	1	NA
DD3S-B6	60516	283	100	102.7	SINGLE BITT	55	1	NA
DD3S-C8	60517	290	65	103.45	42" CLEAT, TYPE 1	20	3	3
DD3S-C9	60518	335	65	103.45	42" CLEAT, TYPE 1	20	1	1
DD3S-CP4	60519	377	101	104.3	CAPSTAN	UNKNOWN	1	1
DD3S-C10	60520	382	65	103.45	42" CLEAT, TYPE 1	20	1	1
DD3S-CP5	60521	394	102	104.5	WINDLASS	UNKNOWN	1	2
DD3S-B7	60522	407	101	102.7	SINGLE BITT	55	1	NA
DD3S-B8	60523	440	101	102.7	SINGLE BITT	55	1	NA
DD3S-C11	60524	435	65	103.45	42" CLEAT TYPE 1	20	1	2
DD3S-C12	60525	479	65	103.45	42" CLEAT TYPE 1	20	1	2
DD3S-B9	60526	499	100	102.7	SINGLE BITT	55	1	NA
DD3S-C13	60527	520	65	103.45	42" CLEAT TYPE 1	20	1	1
DD3S-CP6	60528	559	101	104.7	CAPSTAN	UNKNOWN	1	1
DD3S-C14	60529	560	65	103.45	42" CLEAT TYPE 1	20	1	1

DD3S-C15	60530	600	65	103.45	42" CLEAT TYPE 1	20	1	1
DD3S-C16	60531	640	65	103.45	42" CLEAT TYPE 1	20	1	1
DD3S-CP7	60532	650	101	104.2	CAPSTAN	UNKNOWN	1	1
DD3S-B10	60533	678	100	102.7	SINGLE BITT	55	1	NA
DD3S-C17	60534	683	65	103.45	42" CLEAT TYPE 1	20	1	1
DD3S-C18	60535	711	44	103.45	42" CLEAT TYPE 1	20	1	1

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION, SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 19-2

DRY DOCK No. 3-PORT SIDE								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
DD3P-CP1	60601	-9	101.5	104.5	CAPSTAN	UNKNOWN	1	1
DD3P-C1	60602	10	58	103.45	42" CLEAT TYPE 1	20	2	2
DD3P-C2	60603	32	57	103.45	42" CLEAT TYPE 1	20	1	1
DD3P-C3	60604	60	65	103.45	42" CLEAT TYPE 1	20	1	1
DD3P-B1	60605	95	100	104	SINGLE BITT	55	1	NA
DD3P-C4	60606	100	65	103.45	42" CLEAT TYPE 1	20	1	1
DD3P-B2	60607	125	100	104	SINGLE BITT	55	1	NA
DD3P-C5	60608	143	65	103.45	42" CLEAT TYPE 1	20	1	1
DD3P-B3	60609	158	100	104	SINGLE BITT	55	1	NA
DD3P-CP2	60610	190	101.5	104.7	CAPSTAN	UNKNOWN	1	1
DD3P-C6	60611	195	65	103.45	42" CLEAT TYPE 1	20	1	1
DD3P-B4	60612	220	100	104	SINGLE BITT	55	1	NA
DD3P-C7	60613	250	65	103.45	42" CLEAT TYPE 1	20	1	1
DD3P-B5	60614	253	100	104	SINGLE BITT	55	1	NA
DD3P-B6	60615	284	100	104	SINGLE BITT	55	1	NA
DD3P-C8	60616	300	65	103.45	42" CLEAT TYPE 1	20	3	3
DD3P-C9	60617	336	65	103.45	42" CLEAT TYPE 1	20	1	1
DD3P-C10	60618	380	65	103.45	42" CLEAT TYPE 1	20	1	1
DD3P-B7	60619	394	103	101	SM BOLLARD	UNKNOWN	1	NA
DD3P-C11	60620	432	65	103.45	42" CLEAT TYPE 1	20	1	1
DD3P-B8	60621	455	103	101	SM BOLLARD	UNKNOWN	1	NA
DD3P-C12	60622	477	65	103.45	42" CLEAT TYPE 1	20	1	1
DD3P-C13	60623	517	65	103.45	42" CLEAT TYPE 1	20	1	1
DD3P-CP3	60624	557	100	103.2	CAPSTAN	UNKNOWN	1	1
DD3P-C14	60625	558	65	103.45	42" CLEAT TYPE 1	20	1	1
DD3P-C15	60626	598	65	103.45	42" CLEAT TYPE 1	20	1	1

DD3P-B9	60627	617	100	104	SINGLE BITT	55	1	NA
DD3P-C16	60628	637	65	103.45	42" CLEAT TYPE 1	20	1	1
DD3P-C17	60629	679	64	103.45	42" CLEAT TYPE 1	20	1	1
DD3P-C18	60630	710	48.5	103.45	42" CLEAT TYPE 1	20	1	1

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

3.20 DRY DOCK NO. 4

3.20.1 Description

Dry Dock No. 4 was originally constructed in 1919 and consists of reinforced concrete gravity walls with timber piles supporting the wall. The dry dock's clear width is 128 feet and clear length is 1,091 feet.

3.20.2 Design Structural Capacity

DESIGN STRUCTURAL CAPACITY SUMMARY TABLE			
PIER FACILITY BERTHING AND MOORING ALLOWABLE LOADS *			
FACILITY	DESIGN RATINGS	CALCULATED CAPACITY	
		BERTHING	MOORING
DRY DOCK 4	NONE FOUND	UNKNOWN	UNKNOWN
MOORING FIXTURE RATED AND CALCULATED ALLOWABLE LOADS *			
MOORING FIXTURE	QUANTITY	DESIGN RATINGS	CALCULATED RATING
42" TYPE 2 CLEAT	39	20 TONS	N/A
26" CLEAT	5	UNKNOWN	12 TONS
M BOLLARD	19	UNKNOWN	N/A
SHORT BOLLARD	18	UNKNOWN	N/A
WINDLASS	7	UNKNOWN	6 TONS @ HORIZONTAL
CAPSTAN	8	VARIES - SEE TABLE	N/A
* ALLOWABLE LOADS SHOWN ARE BASED ON ASSUMPTIONS . FOR ACTUAL LIVE LOAD LIMITS ADDITIONAL INVESTIGATION IS REQUIRED. SEE APPENDIX FOR COMPUTATIONS.			
N/A - NO INFORMATION AVAILABLE - INSUFFICIENT DATA FOR CALCULATIONS			

3.20.3 Existing Condition

The existing conditions of each mooring fixture are noted in Data Table No. 20 and [FIG 3-20](#) in this section. The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. Bollard DD4P-B9 has a No. 3 rating due to a vertical crack at the top of the fitting. This fitting should be monitored under load to determine the effect of the crack on the fitting. If there is significant movement under load, the fitting should be replaced. Windlass DD4P-CP8 has a crack in the top plate and is missing several ratchet dogs. The crack and dogs should be repaired/replaced as soon as possible. All other fittings on Dry Dock No. 4 have 1 or 2 ratings and are considered to be in good condition.



Photo 3.20-1, Dry Dock 4, fitting DD4S-C11, 42" type 1 cleat in good condition, # 1 rating.



Photo 3.20-2, Dry Dock 4, fitting DD4S-B8, M bollard in good condition, # 1 rating.



Photo 3.20-3, Dry Dock 4, fitting DD4S-B7, short bollard in good condition, # 1 rating.

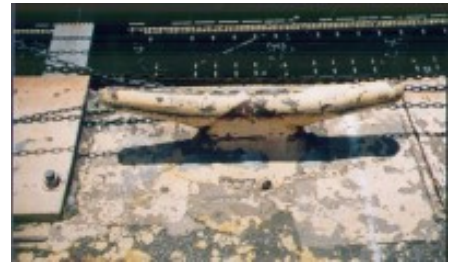


Photo 3.20-4, Dry Dock 4, fitting DD4S-C9, 42" type 2 cleat in good condition, # 1 rating.



Photo 3.20-5, Dry Dock 4, fitting DD4S-B6, M bollard in good condition, # 1 rating.



Photo 3.20-6, Dry Dock 4, fitting DD4S-CP2, windlass in good condition, # 2 rating.



Photo 3.20-7, Dry Dock 4, fitting DD4S-C22, 26" cleat in good condition, # 1 rating.

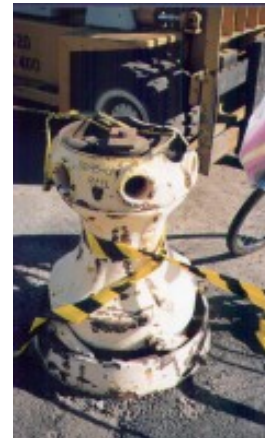


Photo 3.20-8, Dry Dock 4, fitting DD4S-CP5, windlass no rating.



Photo 3.20-9, Dry Dock 4, fitting DD4S-CP3, capstan in good condition, # 1 rating.



Photo 3.20-10, Dry Dock 4, fitting DD4P-C20, 26" cleat in good condition, # 1 rating.



Photo 3.20-11, Dry Dock 4, fitting DD4P-B1, short bollard in good condition, # 1 rating.



Photo 3.20-12, Dry Dock 4, fitting DD4P-CP8 Sta. 7+97, windlass top plate is cracked and is missing several ratchet dogs, #3 rating.

NORFOLK NAVAL SHIPYARD **MOORING CONDITION REPORT**

DATA TABLE NO. 20-1

DRY DOCK No. 4-STARBOARD SIDE								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
DD4S-C1	60701	-9	65.5	101.2	42" CLEAT, TYPE 2	20	1	1
DD4S-CP1	60702	9	111.3	103.2	CAPSTAN	UNKNOWN	1	1
DD4S-C2	60703	10	69	101.2	42" CLEAT, TYPE 2	20	1	1
DD4S-B1	60704	31	111.7	104.45	M BOLLARD	UNKNOWN	1	1
DD4S-C3	60705	33	68	101.2	42" CLEAT, TYPE 2	20	1	1
DD4S-C4	60706	49	72.5	101.2	42" CLEAT, TYPE 2	20	1	1
DD4S-B2	60707	77	111.7	104.45	M BOLLARD	UNKNOWN	1	1
DD4S-CP2	60708	96	120	104.45	WINDLASS	UNKNOWN	2	1
DD4S-B3	60709	117	111.7	104.45	M BOLLARD	UNKNOWN	1	1
DD4S-C5	60710	148	72	101.2	42" CLEAT, TYPE 2	20	1	1
DD4S-B4	60711	175	111.7	104.45	M BOLLARD	UNKNOWN	1	1
DD4S-C6	60712	183	72	101.2	42" CLEAT, TYPE 2	20	1	1
DD4S-B5	60713	210	101.7	104.45	M BOLLARD	UNKNOWN	1	1
DD4S-C7	60714	234	72	101.2	42" CLEAT, TYPE 2	20	1	1
DD4S-B6	60715	255	101.7	104.45	M BOLLARD	UNKNOWN	1	1
DD4S-C8	60716	275	72	101.2	42" CLEAT, TYPE 2	20	1	1
DD4S-C9	60717	318	72	101.2	42" CLEAT, TYPE 2	20	1	1
DD4S-B7	60718	330	84	103.5	SHORT BOLLARD	UNKNOWN	1	1
DD4S-B8	60719	345	116	103.7	M BOLLARD	UNKNOWN	1	2
DD4S-C10	60720	352	72	101.2	42" CLEAT, TYPE 2	20	1	1
DD4S-B9	60721	404	116	103.7	SHORT BOLLARD	UNKNOWN	1	1
DD4S-C11	60722	410	72	101.2	42" CLEAT, TYPE 2	20	1	1
DD4S-C12	60723	457	72	101.2	42" CLEAT, TYPE 2	20	1	1
DD4S-C13	60724	507	72	101.2	42" CLEAT, TYPE 2	20	1	1
DD4S-CP3	60725	516	110	103.2	CAPSTAN	UNKNOWN	1	1
DD4S-B10	60726	535	110	104.45	M BOLLARD	UNKNOWN	1	1

DD4S-C14	60727	556	72	101.2	42" CLEAT, TYPE 2	20	1	1
DD4S-B11	60728	576	110	104.45	M BOLLARD	UNKNOWN	1	NA

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

NORFOLK NAVAL SHIPYARD **MOORING CONDITION REPORT**

DATA TABLE NO. 20-2

DRY DOCK No. 4-STARBOARD SIDE								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
DD4S-C15	60729	593	72	101.2	42" CLEAT, TYPE 2	20	1	1
DD4S-B12	60730	616	110	104.45	M BOLLARD	UNKNOWN	1	NA
DD4S-B13	60731	683	110	104.45	M BOLLARD	UNKNOWN	1	NA
DD4S-C16	60732	689	72	101.2	42" CLEAT, TYPE 2	20	1	1
DD4S-CP4	60733	710	110	103.2	CAPSTAN	UNKNOWN	1	1
DD4S-B14	60734	733	110	104.45	M BOLLARD	UNKNOWN	1	1
DD4S-B15	60735	773	110	104.45	M BOLLARD	UNKNOWN	1	NA
DD4S-C17	60736	780	72	101.2	42" CLEAT, TYPE 2	20	1	1
DD4S-C18	60737	853	72	101.2	42" CLEAT, TYPE2	UNKNOWN	1	1
DD4S-B16	60738	874	110	104.45	M BOLLARD	12	1	NA
DD4S-C19	60739	903	72	101.2	26"CLEAT	12	1	1
DD4S-CP5	60740	913	110	104.2	WINDLASS	UNKNOWN	NA	NA
DD4S-B17	60741	934	110	104.45	M BOLLARD	UNKNOWN	1	NA
DD4S-C20	60742	946	72	101.2	26"CLEAT	12	1	1
DD4S-C21	60743	998	55.5	101.2	26"CLEAT	12	1	1
DD4S-C22	60744	1021	20	101.2	26"CLEAT	12	1	1
DD4S-B18	60745	1010	83	104.45	M BOLLARD	UNKNOWN	1	NA
DD4S-B19	60746	1016	77	104.45	M BOLLARD	UNKNOWN	1	NA

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 20-3

DRY DOCK No. 4-PORT SIDE								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
DD4P-C22	60801	-3.5	90.5	101.2	26" CLEAT	12	1	1
DD4P-CP1	60802	2	93	103.2	CAPSTAN	UNKNOWN	1	1
DD4P-C1	60803	10	66	101.2	42" CLEAT, TYPE 2	20	1	1
DD4P-B1	60804	32	85	103.5	SHORT BOLLARD	UNKNOWN	1	NA
DD4P-C2	60805	34	68	101.2	42" CLEAT, TYPE 2	20	1	1
DD4P-C3	60806	47	74	101.2	42" CLEAT, TYPE 2	20	1	1
DD4P-B2	60807	60	84	103.5	SHORT BOLLARD	UNKNOWN	1	NA
DD4P-CP2	60808	72	100	104.4	WINDLASS	UNKNOWN	1	1
DD4P-B3	60809	90	84	103.5	SHORT BOLLARD	UNKNOWN	1	NA
DD4P-C4	60810	114	74	101.2	42" CLEAT, TYPE 2	20	1	1
DD4P-CP3	60811	121	91	104.5	CAPSTAN	UNKNOWN	1	1
DD4P-B4	60812	141	91	103.5	SHORT BOLLARD	UNKNOWN	1	NA
DD4P-C5	60813	157	74	101.2	42" CLEAT, TYPE 2	20	1	1
DD4P-C6	60814	212	74	101.2	42" CLEAT, TYPE 2	20	1	1
DD4P-C7	60815	261	74	101.2	42" CLEAT, TYPE 2	20	1	1
DD4P-C8	60816	318	74	101.2	42" CLEAT, TYPE 2	20	1	1
DD4P-C9	60817	374	74	101.2	42" CLEAT, TYPE 2	20	1	1
DD4P-B5	60818	417	84	103.5	SHORT BOLLARD	UNKNOWN	1	NA
DD4P-CP4	60819	430	84	104.4	WINDLASS	UNKNOWN	1	1
DD4P-C10	60820	432	74	101.2	42" CLEAT, TYPE 2	20	1	1
DD4P-B6	60821	442	84	103.5	SHORT BOLLARD	UNKNOWN	1	1
DD4P-CP5	60822	459	84	103.2	CAPSTAN	UNKNOWN	1	1
DD4P-C11	60823	467	74	101.2	42" CLEAT, TYPE 2	20	1	1
DD4P-B7	60824	488	84	103.5	SHORT BOLLARD	UNKNOWN	1	1
DD4P-C12	60825	508	74	101.2	42" CLEAT, TYPE 2	20	1	1
DD4P-B8	60826	533	84	103.5	SHORT BOLLARD	UNKNOWN	1	1
DD4P-C13	60827	558	74	101.2	42" CLEAT, TYPE 2	20	1	1

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION, SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 20-4

DRY DOCK No. 4-PORT SIDE								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)		TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
DD4P-B9	60828	576	84	103.5	SHORT BOLLARD	UNKNOWN	3	NA
DD4P-C14	60829	593	74	101.2	42" CLEAT, TYPE 2	20	1	1
DD4P-CP6	60830	598	84	104.4	WINDLASS	UNKNOWN	1	1
DD4P-B10	60831	623	84	103.5	SHORT BOLLARD	UNKNOWN	1	NA
DD4P-B11	60832	673	84	103.5	SHORT BOLLARD	UNKNOWN	1	NA
DD4P-C15	60833	693	74	101.2	42" CLEAT, TYPE 2	20	1	1
DD4P-CP7	60834	709	84	103.95	CAPSTAN	UNKNOWN	1	1
DD4P-B12	60835	723	84	103.5	SHORT BOLLARD	UNKNOWN	1	1
DD4P-B13	60836	773	84	103.5	SHORT BOLLARD	UNKNOWN	1	NA
DD4P-C16	60837	794	74	101.2	42" CLEAT, TYPE 2	20	1	1
DD4P-CP8	60838	797	84	103.95	WINDLASS	UNKNOWN	3	1
DD4P-B14	60839	817	84	103.5	SHORT BOLLARD	UNKNOWN	1	1
DD4P-C17	60840	856	74	101.2	42" CLEAT, TYPE 2	20	1	1
DD4P-B15	60841	877	84	103.5	SHORT BOLLARD	UNKNOWN	1	NA
DD4P-C18	60842	906	74	101.2	42" CLEAT, TYPE 2	20	1	2
DD4P-CP9	60843	907	84	103.95	WINDLASS	UNKNOWN	2	1
DD4P-B16	60844	937	84	103.5	SHORT BOLLARD	UNKNOWN	1	1
DD4P-C19	60845	948	74	101.2	42" CLEAT, TYPE 2	20	1	1
DD4P-C20	60846	998.5	53	101.2	42" CLEAT, TYPE 2	20	1	1
DD4P-C21	60847	1020	15	101.2	42" CLEAT, TYPE 2	20	1	1
DD4P-B17	60848	1019	73	103.5	SHORT BOLLARD	UNKNOWN	1	NA
DD4P-CP10	60849	1043	84	104.4	CAPSTAN	UNKNOWN	1	1
DD4P-B18	60849	1059	5	104.4	M BOLLARD	UNKNOWN	1	NA

CONDITION RATING KEY

1 = EXCELLENT (NEW - NO DAMAGE)

2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 = MARGINAL (SIGNIFICANT CORROSION, SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

3.21 DRY DOCK NOS. 6 and 7

3.21.1 Description

Dry Dock No. 6 was originally constructed in 1919 and consists of reinforced concrete gravity walls with timber piles supporting the wall. The dry dock's clear width is 77 feet and clear length is 438 feet. Dry Dock No. 7, originally constructed in 1919 consists of reinforced concrete gravity walls with timber piles supporting the wall. The dry dock's clear width is 77 feet and clear length is 438 feet.

3.21.2 Design Structural Capacity

<u>DESIGN STRUCTURAL CAPACITY SUMMARY TABLE</u>			
PIER FACILITY BERTHING AND MOORING ALLOWABLE LOADS *			
FACILITY	DESIGN RATINGS	CALCULATED CAPACITY	
		BERTHING	MOORING
DRY DOCKS 6 & 7	NONE FOUND	UNKNOWN	UNKNOWN
MOORING FIXTURE RATED AND CALCULATED ALLOWABLE LOADS *			
MOORING FIXTURE	QUANTITY	DESIGN RATINGS	CALCULATED RATING
26" CLEAT	55	UNKNOWN	12 TONS
SHORT BOLLARD	8	UNKNOWN	N/A
M BOLLARD	9	UNKNOWN	N/A
WINDLASS	6	UNKNOWN	6 TONS @ HORIZONTAL
CAPSTAN	1	VARIES - SEE TABLE	N/A
* ALLOWABLE LOADS SHOWN ARE BASED ON ASSUMPTIONS . FOR ACTUAL LIVE LOAD LIMITS ADDITIONAL INVESTIGATION IS REQUIRED. SEE APPENDIX FOR COMPUTATIONS. N/A - NO INFORMATION AVAILABLE - INSUFFICIENT DATA FOR CALCULATIONS			

3.21.3 Existing Condition

The existing conditions of each mooring fixture are noted in Data Table No. 21 and [FIG 3-21](#) & [FIG 3-22](#) in this section. The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. On Dry Dock No. 6 there are two cleats, DD6S-C89 and DD6S-C14 that have received a No. 4 rating due to broken horns. These cleats should be replaced in-kind. On Dry Dock No. 6 and Dry Dock No. 7 cleats, DD6P-C6 and DD7P-C2 have received a No. 3 rating due to cracking of the concrete base. For repairs, any loose or disintegrated concrete should be chipped out and replaced with new concrete mechanically bonded to existing sound concrete. All other fittings on Dry Dock No. 6 and No. 7 have 1 or 2 ratings and are considered to be in good condition.



Photo 3.21-1, Dry Dock 6, fitting DD6S-C2, 26" cleat in good condition , #2 rating.



Photo 3.21-2, Dry Dock 6, fitting DD6S-C4, 26" cleat in good condition, # 1 rating.



Photo 3.21-3, Dry Dock 6, fitting DD6S-C5, 26" cleat in good condition, # 1 rating.



Photo 3.21-4, Dry Dock 6, fitting DD6S-CP1, windlass in good condition, # 1 rating.



Photo 3.21-5, Dry Dock 6, fitting DD6S-C8, 26" cleat with broken horn, # 4 rating.

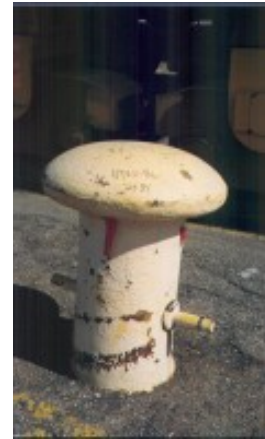


Photo 3.21-6, Dry Dock 6, fitting DD6S-B6, M bollard in good condition, # 1 rating.



Photo 3.21-7, Dry Dock 6, fitting DD6S-C14, 26" cleat with broken horn, # 4 rating.



Photo 3.21-8, Dry Dock 6, fitting DD6/7-B2, short bollard with bent pin otherwise in good condition, # 1 rating.



Photo 3.21-9, Dry Dock 6, fitting DD6P-C6, 26" cleat with base concrete disintegrated, #3 rating.



Photo 3.21-10, Dry Dock 7, fitting DD7S-CP1, capstan in good condition, #1 rating.



Photo 3.21-11, Dry Dock 7, fitting DD7P-C14, 26" cleat in good condition , minor cracking of concrete base, #2 rating.



Photo 3.21-12, Dry Dock 7, fitting DD7P-C13, 26" cleat in good condition, # 1 rating.



Photo 3.21-13, Dry Dock 7, fitting DD7P-C11, 26" cleat in good condition, # 1 rating.



Photo 3.21-14, Dry Dock 7, fitting DD7P-C9, 26" cleat in good condition with minor cracking of concrete base, # 2 rating.



Photo 3.21-15, Dry Dock 7, fitting DD7P-C8, 26" cleat in good condition, #1 rating.



Photo 3.21-16, Dry Dock 7, fitting DD7S-C2, 26" cleat in good condition with minor cracking of concrete base, # 2 rating.



Photo 3.21-17, Dry Dock 7, fitting DD7P-C2, Sta. 0+12, 26" cleat, cracking noted at concrete base, #3 rating.

MOORING CONDITION REPORT

DATA TABLE NO. 21-1

DRY DOCK No. 6-STARBOARD SIDE								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
DD6S-C1	60901	-18	32	101	26" CLEAT	12	1	1
DD6S-C2	60902	11	30	101	26" CLEAT	12	1	2
DD6S-B1	60903	10	68	104	M BOLLARD	UNKNOWN	1	NA
DD6S-C3	60904	36	35	101	26" CLEAT	12	1	1
DD6S-B2	60905	42	66	104.25	M BOLLARD	UNKNOWN	1	NA
DD6S-C4	60906	60	35	101	26" CLEAT	12	1	1
DD6S-CP1	60907	82	68	104	WINDLASS	UNKNOWN	1	NA
DD6S-C5	60908	84	35	101	26" CLEAT	12	1	1
DD6S-C6	60909	108	35	101	26" CLEAT	12	1	1
DD6S-B3	60910	125	65	104.25	M BOLLARD	UNKNOWN	1	NA
DD6S-C7	60911	143	35	101	26" CLEAT	12	1	1
DD6S-B4	60912	157	64	104.25	M BOLLARD	UNKNOWN	1	NA
DD6S-C8	60913	189	35	101	26" CLEAT	12	4	1
DD6S-CP2	60914	190	61.5	104	WINDLASS	UNKNOWN	1	NA
DD6S-C9	60915	229	35	101	26" CLEAT	12	1	1
DD6S-B5	60916	251	58	104.25	M BOLLARD	UNKNOWN	1	NA
DD6S-C10	60917	269	35	101	26" CLEAT	12	1	1
DD6S-B6	60918	284	58	104.25	M BOLLARD	UNKNOWN	1	NA
DD6S-C11	60919	319	35	101	26" CLEAT	12	1	1
DD6S-C12	60920	366	34	101	26" CLEAT	12	1	1
DD6S-C13	60921	408	27	101	26" CLEAT	12	1	1
DD6S-C14	60922	441	7	101	26" CLEAT	12	4	1

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION, SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 21-2

DRY DOCK No. 6-PORT SIDE								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
DD6P-C1	61001	12	41	101	26" CLEAT	12	1	1
DD6P-C2	61002	37	42	101	26" CLEAT	12	1	1
DD6P-C3	61003	60	43	101	26" CLEAT	12	1	1
DD6P-C4	61004	84	44	101	26" CLEAT	12	1	1
DD6P-C5	61005	108	44	101	26" CLEAT	12	1	1
DD6P-C6	61006	144	44	101	26" CLEAT	12	1	2
DD6P-C7	61007	189	44	101	26" CLEAT	12	1	1
DD6P-C8	61008	229	44	101	26" CLEAT	12	1	1
DD6P-C9	61009	269	44	101	26" CLEAT	12	1	1
DD6P-C10	61010	318	44	101	26" CLEAT	12	1	1
DD6P-C11	61011	365	43	101	26" CLEAT	12	1	1
DD6P-C12	61012	406	36	101	26" CLEAT	12	1	1
DD6P-C13	61013	423	34	101	26" CLEAT	12	1	1
DD6P-C14	61014	441	16	101	26" CLEAT	12*	1	1

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 21-3

DRY DOCKS Nos. 6 & 7 SHARED HARDWARE								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
DD6/7-B1	61101	10	0	103.5	SHORT BOLLARD	UNKNOWN	1	1
DD6/7-B2	61102	42	0	103.5	SHORT BOLLARD	UNKNOWN	1	1
DD6/7-CP1	61103	83	0	104	WINDLASS	UNKNOWN	1	1
DD6/7-B3	61104	123	0	103.5	SHORT BOLLARD	UNKNOWN	1	1
DD6/7-B4	61105	164	0	103.5	SHORT BOLLARD	UNKNOWN	1	NA
DD6/7-CP2	61106	206	0	104	WINDLASS	UNKNOWN	1	NA
DD6/7-B5	61107	247	0	103.5	SHORT BOLLARD	UNKNOWN	1	NA
DD6/7-B6	61108	287	0	103.5	SHORT BOLLARD	UNKNOWN	1	NA
DD6/7-CP3	61109	327	0	104	WINDLASS	UNKNOWN	1	NA
DD6/7-B7	61110	369	0	103.5	SHORT BOLLARD	UNKNOWN	1	NA
DD6/7-B8	61111	409	0	103.5	SHORT BOLLARD	UNKNOWN	1	1

CONDITION RATING KEY

1

1= EXCELLENT (NEW - NO DAMAGE)

2

2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3

3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4

4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

X AXIS RUNS ALONG THE CENTER OF THE ISLAND DIVIDING DRY DOCKS 6 & 7

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 21-4

DRY DOCK No. 7-STARBOARD SIDE								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
DD7S-C1	61201	11	35	101	26" CLEAT	12	1	1
DD7S-C2	61202	29	41	101	26" CLEAT	12	1	2
DD7S-C3	61203	51	40	101	26" CLEAT	12	1	2
DD7S-C4	61204	80	40	101	26" CLEAT	12	1	1
DD7S-C5	61205	108	40	101	26" CLEAT	12	1	1
DD7S-C6	61206	145	40	101	26" CLEAT	12	1	1
DD7S-C7	61207	189	40	101	26" CLEAT	12	1	1
DD7S-C8	61208	229	40	101	26" CLEAT	12	1	1
DD7S-C9	61209	267	40	101	26" CLEAT	12	1	1
DD7S-C10	61210	318	40	101	26" CLEAT	12	1	2
DD7S-C11	61211	365	39.5	101	26" CLEAT	12	1	1
DD7S-C13	61212	422	32	101	26" CLEAT	12	1	1
DD7S-C14	61213	442	17	101	26" CLEAT	12	1	2
DD7S-CP1	61214	470	30	103.8	CAPSTAN	UNKNOWN	1	1

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 21-5

DRY DOCK No. 7-PORT SIDE								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
DD7P-C1	61301	-18	36	101	26" CLEAT	12	1	1
DD7P-C2	61302	12	35	101	26" CLEAT	12	1	3
DD7P-C3	61303	30	38	101	26" CLEAT	12	1	2
DD7P-B1	61304	49	62	104.2	M BOLLARD	UNKNOWN	1	NA
DD7P-C4	61305	50	38	101	26" CLEAT	12	1	2
DD7P-C5	61306	80	38	101	26" CLEAT	12	1	2
DD7P-C6	61307	109	38	101	26" CLEAT	12	1	2
DD7P-B2	61308	120	62	104.2	M BOLLARD	UNKNOWN	1	NA
DD7P-C7	61309	143	38	101	26" CLEAT	12	1	1
DD7P-B3	61310	150	62	104.2	M BOLLARD	UNKNOWN	1	NA
DD7P-C8	61311	179	38	101	26" CLEAT	12	1	1
DD7P-C9	61312	226	38	101	26" CLEAT	12	1	2
DD7P-C10	61313	267	38	101	26" CLEAT	12	1	1
DD7P-CP1	61314	270	57	104.2	WINDLASS	UNKNOWN	1	NA
DD7P-C11	61315	315	38	101	26" CLEAT	12	1	1
DD7P-C12	61316	362	37.5	101	26" CLEAT	12	1	1
DD7P-C13	61317	420	28	101	26" CLEAT	12	1	1
DD7P-C14	61318	442	14	101	26" CLEAT	12	1	2

CONDITION RATING KEY

1 1 = EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION, SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD



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3.22 DRY DOCK NO. 8

3.22.1 Description

Dry Dock No. 8 was originally constructed in 1942 and consists of reinforced concrete gravity walls with timber piles supporting the wall. The dry dock's clear width is 149.5 feet and clear length is 1,141 feet.

3.22.2 Design Structural Capacity

DESIGN STRUCTURAL CAPACITY SUMMARY TABLE			
PIER FACILITY BERTHING AND MOORING ALLOWABLE LOADS *			
FACILITY	DESIGN RATINGS	CALCULATED CAPACITY	
		BERTHING	MOORING
DRY DOCK 8	NONE FOUND	UNKNOWN	UNKNOWN
MOORING FIXTURE RATED AND CALCULATED ALLOWABLE LOADS *			
MOORING FIXTURE	QUANTITY	DESIGN RATINGS	CALCULATED RATING
42" TYPE 3 CLEAT	44	20 TONS	N/A
42" TYPE 2 CLEAT	3	20 TONS	N/A
42" TYPE 1 CLEAT	2	20 TONS	N/A
BOLLARD	31	50 TONS	N/A
CAPSTAN	11	VARIES - SEE TABLE	N/A
* ALLOWABLE LOADS SHOWN ARE BASED ON ASSUMPTIONS . FOR ACTUAL LIVE LOAD LIMITS ADDITIONAL INVESTIGATION IS REQUIRED. SEE APPENDIX FOR COMPUTATIONS. N/A - NO INFORMATION AVAILABLE - INSUFFICIENT DATA FOR CALCULATIONS			

3.22.3 Existing Condition

The existing conditions of each mooring fixture are noted in Data Table No. 22 and [FIG 3-23](#) in this section. The fixtures are rated based on a scale of 1 to 4 with 1 being excellent condition and 4 being poor condition. Both the fixture and its base are rated in this manner. All fittings on Dry Dock No. 8 have 1 or 2 ratings and are considered to be in good condition.



Photo 3.22-1, Dry Dock 8, fitting DD8S-CP2, capstan in good condition, # 1 rating.



Photo 3.22-2, Dry Dock 8, fitting DD8S-C4, 42" type 3 cleat in good condition, # 2 rating.



Photo 3.22-3, Dry Dock 8, fitting DD8S-C2, 42" type 1 cleat in good condition, # 1 rating.



Photo 3.22-4, Dry Dock 8, fitting DD8S-C26, 42" type 2 cleat in good condition, # 1 rating.



Photo 3.22-5, Dry Dock 8, fitting DD8S-B12, bollard with base paved over, # 1 rating.

Photo 3.22-6, Dry Dock 8, fitting DD8P-B17, bollard in good condition, # 1 rating.

NORFOLK NAVAL SHIPYARD **MOORING CONDITION REPORT**

DATA TABLE NO. 22-1

DRY DOCK No.8-STARBOARD SIDE								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
DD8S-B1	61401	10	137	106	BOLLARD	50	1	NA
DD8S-C1	61402	12	79.5	103	42" CLEAT TYPE 3	20	1	2
DD8S-C2	61403	50	77.5	103.7	42" CLEAT, TYPE 1	20	1	1
DD8S-B2	61404	58	137	106	BOLLARD	50	1	NA
DD8S-C3	61405	85	77.5	103.7	42" CLEAT, TYPE 3	20	1	2
DD8S-B3	61406	110	137	106	BOLLARD	50	1	NA
DD8S-C4	61407	130	77.5	103.7	42" CLEAT, TYPE 3	20	1	2
DD8S-C5	61408	186	77.5	103.7	42" CLEAT, TYPE 3	20	1	2
DD8S-B4	61409	210	137	1	BOLLARD	50	1	NA
DD8S-C6	61410	236	77.5	103.7	42" CLEAT, TYPE 3	20	1	1
DD8S-B5	61411	260	137	106	BOLLARD	50	1	NA
DD8S-C7	61412	286	77.5	103.7	42" CLEAT, TYPE 3	20	1	1
DD8S-CP1	61413	309	137	106	CAPSTAN	UNKNOWN	1	1
DD8S-C8	61414	330	77.5	103.7	42" CLEAT, TYPE 3	20	NA	NA
DD8S-B6	61415	358	137	416	BOLLARD	50	1	NA
DD8S-C9	61416	386	77.5	106	42" CLEAT, TYPE 3	20	NA	NA
DD8S-C10	61417	430	77.5	103.7	42" CLEAT, TYPE 3	20	NA	NA
DD8S-B7	61418	456	137	106	BOLLARD	50	1	2
DD8S-CP2	61419	473	137	106	CAPSTAN	UNKNOWN	1	1
DD8S-C11	61420	480	77.5	103.7	42" CLEAT, TYPE 3	20	1	1
DD8S-B8	61421	505	137	106	BOLLARD	50	1	2
DD8S-C12	61422	530	77.5	103.7	42" CLEAT, TYPE 3	20	1	1
DD8S-CP3	61423	556	137	106	CAPSTAN	UNKNOWN	1	1

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION, SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4

4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

NORFOLK NAVAL SHIPYARD **MOORING CONDITION REPORT**

DATA TABLE NO. 22-2

DRY DOCK No. 8-STARBOARD SIDE								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
DD8S-C13	61424	580	77.5	103.7	42" CLEAT, TYPE 3	20	NA	NA
DD8S-C14	61425	616	77.5	103.7	42" CLEAT, TYPE 3	20	NA	NA
DD8S-B9	61426	653	137	106	BOLLARD	50	1	NA
DD8S-C15	61427	673	77.5	103.7	42" CLEAT, TYPE 3	20	NA	NA
DD8S-B10	61428	705	137	106	BOLLARD	50	1	NA
DD8S-C16	61429	730	77.5	103.7	42" CLEAT, TYPE 3	20	1	1
DD8S-B11	61430	755	137	106	BOLLARD	50	2	NA
DD8S-C17	61431	778	77.5	103.7	42" CLEAT, TYPE 3	20	1	2
DD8S-CP4	61432	804	137	106	CAPSTAN	UNKNOWN	NA	NA
DD8S-C18	61433	830	77.5	103.7	42" CLEAT, TYPE 3	20	1	2
DD8S-C19	61434	880	77.5	103.7	42" CLEAT, TYPE 3	20	1	1
DD8S-B12	61435	915	137	106	BOLLARD	50	1	NA
DD8S-C20	61436	925	77.5	103.7	42" CLEAT, TYPE 3	20	1	1
DD8S-C21	61437	980	77.5	103.7	42" CLEAT, TYPE 3	20	1	1
DD8S-B13	61438	1005	137	106	BOLLARD	50	1	NA
DD8S-C22	61439	1030	77.5	103.7	42" CLEAT, TYPE 3	20	1	2
DD8S-B14	61440	1055	137	106	BOLLARD	50	1	NA
DD8S-C23	61441	1080	77.5	103.7	42" CLEAT, TYPE 2	20	1	1
DD8S-CP5	61442	1105	137	106	CAPSTAN	UNKNOWN	1	1
DD8S-C24	61443	1103	30	103.7	42" CLEAT, TYPE 3	20	1	1
DD8S-C25	61444	1103	-6	103.7	42" CLEAT, TYPE 2	20	1	1
DD8S-C26	61445	1103	-50	103.7	42" CLEAT, TYPE 2	20	1	1

CONDITION RATING KEY

1

1= EXCELLENT (NEW - NO DAMAGE)

2

2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3

3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4

4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

NORFOLK NAVAL SHIPYARD

MOORING CONDITION REPORT

DATA TABLE NO. 22-3

DRY DOCK No. 8-PORT SIDE								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
DD8P-B1	61501	-46	138	106	BOLLARD	50	1	NA
DD8P-B2	61502	10	136	106	BOLLARD	50	1	1
DD8P-C1	61503	12	80	103	42" CLEAT, TYPE 3	20	1	2
DD8P-C2	61504	46	76	103	42" CLEAT, TYPE 1	20	1	1
DD8P-B3	61505	60	136	105.8	BOLLARD	50	1	1
DD8P-C3	61506	84	76	103	42" CLEAT, TYPE 3	20	1	1
DD8P-B4	61507	110	136	106	BOLLARD	50	1	1
DD8P-C4	61508	128	76	103	42" CLEAT, TYPE 3	20	1	1
DD8P-B5	61509	159	136	106	BOLLARD	50	1	NA
DD8P-C5	61510	183	76	103	42" CLEAT, TYPE 3	20	1	1
DD8P-B6	61511	208	136	106	BOLLARD	50	1	NA
DD8P-C6	61512	233	76	103	42" CLEAT, TYPE 3	20	NA	NA
DD8P-B7	61513	257	136	106	BOLLARD	50	1	NA
DD8P-C7	61514	283	76	103	42" CLEAT, TYPE 3	20	1	1
DD8P-CP1	61515	307	136	105.8	CAPSTAN	UNKNOWN	1	1
DD8P-C8	61516	330	76	103	42" CLEAT, TYPE 3	20	1	1
DD8P-C9	61517	380	76	103	42" CLEAT, TYPE 3	20	1	1
DD8P-CP2	61518	395	136	105.8	CAPSTAN	UNKNOWN	1	1
DD8P-B8	61519	407	136	106	BOLLARD	50	1	1
DD8P-C10	61520	430	76	103	42" CLEAT, TYPE 3	20	1	1
DD8P-B9	61521	456	136	106	BOLLARD	50	1	1
DD8P-C11	61522	480	76	103	42" CLEAT, TYPE 3	20	1	1
DD8P-C12	61523	530	76	103	42" CLEAT, TYPE 3	20	NA	NA
DD8P-CP3	61524	557	136	105.8	CAPSTAN	UNKNOWN	1	1

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION , SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD

NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

DATA TABLE NO. 22-4

DRY DOCK No. 8-PORT SIDE								
FITTING #	NODE #	X COORD. (Ft)	Y COORD. (Ft)	Z COORD. (Ft)	TYPE OF FITTING	LINE PULL * (TONS)	CONDITION OF FITTING	
							FITTING	BASE
DD8P-C13	61525	580	76	103	42" CLEAT, TYPE 3	20	1	1
DD8P-B10	61526	607	133	106	BOLLARD	50	1	2
DD8P-C13	61527	630	76	103	42" CLEAT, TYPE 3	20	1	1
DD8P-B11	61528	658	133	106	BOLLARD	50	1	2
DD8P-C15	61529	674	76	103	42" CLEAT, TYPE 3	20	1	1
DD8P-CP4	61530	682	133	105.8	CAPSTAN	UNKNOWN	NA	NA
DD8P-B12	61531	708	133	106	BOLLARD	50	1	1
DD8P-C16	61532	730	76	103	42" CLEAT, TYPE 3	20	1	1
DD8P-C17	61533	780	76	103	42" CLEAT, TYPE 3	20	1	1
DD8P-CP5	61534	810	133	105.8	CAPSTAN	UNKNOWN	NA	NA
DD8P-C18	61535	830	76	103	42" CLEAT, TYPE 3	20	NA	NA
DD8P-B13	61536	859	133	106	BOLLARD	50	1	2
DD8P-C19	61537	880	76	103	42" CLEAT, TYPE 3	20	1	1
DD8P-B14	61538	909	133	106	BOLLARD	50	1	1
DD8P-C20	61539	930	76	103	42" CLEAT, TYPE 3	20	1	1
DD8P-B15	61540	961	133	106	BOLLARD	50	1	2
DD8P-C21	61541	986	76	103	42" CLEAT, TYPE 3	20	1	1
DD8P-B16	61542	1012	133	106	BOLLARD	50	1	1
DD8P-C22	61543	1040	76	103	42" CLEAT, TYPE 3	20	1	1
DD8P-B17	61544	1083	133	106	BOLLARD	50	1	2
DD8P-C23	61545	1090	76	103	42" CLEAT, TYPE 3	20	1	2
DD8P-CP6	61546	1113	133	105.8	CAPSTAN	UNKNOWN	1	1

CONDITION RATING KEY

1 1= EXCELLENT (NEW - NO DAMAGE)

2 2 = SATISFACTORY (MINOR CORROSION, SCALING AND CRACKING)

3 3 = MARGINAL (SIGNIFICANT CORROSION, SCALING AND CRACKING POSSIBLE LOSS OF STRENGTH)

4 4 = POOR (NON-FUNCTIONAL, BROKEN, FAILED, OBVIOUS DISPLACEMENT)

NA = NOT ACCESSIBLE

* LESSER OF RATED OR CALCULATED HORIZONTAL LOAD



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COVER PAGE

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APPENDIX A

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Mr. Craig D. Sams, P.E., Engineer/Diver

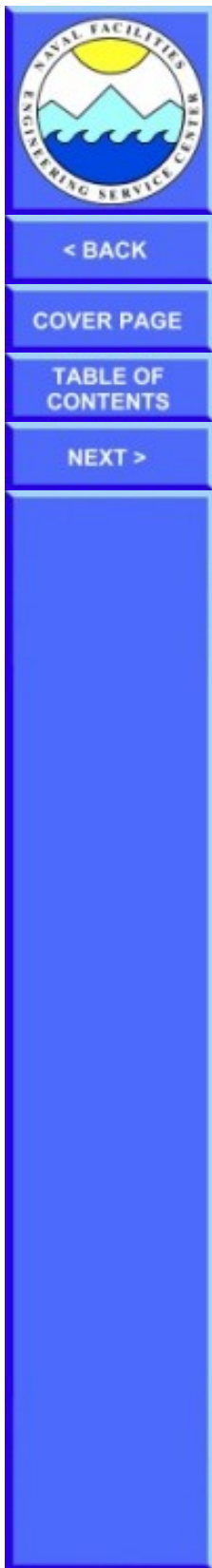
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APPENDIX B

LOAD TEST PROCEDURES

A. Purpose of testing

The purpose of this test is to demonstrate satisfactory strength of in-place mooring fittings.

B. Location of Fittings

Fittings are located and identified by an alpha-numeric system based on the location within the shipyard. These locations and identification numbers are located on the plans accompanying this report.

C. Typical Fitting Characteristics and Ratings

Rated fitting capacities vary between manufacturers. Appendix C has documentation of capacity for various fittings. See Table B-1 for typical ratings for common fittings.

Table B-1

Commonly Used U.S. Navy Pier Mooring Fittings

<u>Description</u>	<u>Size</u>	<u>Bolts</u>	<u>Working Capacity (kips)</u>
Special Mooring Bollard "A"	Height = 48 in. Base 48x48 in.	12 x 2.75-in. dia.	Horiz. = 660 @ 45° = 430 Nom = 450
Special Mooring Bollard "B"	Height = 44.5 in. Base 39x39 in.	8 x 1.25-in dia.	Horiz. = 270 @ 45° = 216 Nom = 400
Large Bollard With Horn	Height = 44.5 Base 39x39 in.	4 x 1.75-in. dia.	Horiz. = 104 @ 45° = 66 Nom = 70
Large Double Bitt With Lip	Height = 26 in. Base 73.5 x 28 in.	10 x 1.75-in. dia.	Nom = 75*
Low Double Bitt With Lip	Height = 18 in. Base 57.5 x 21.5 in.	10 x 1.625-in. dia.	Nom = 60*
42 Inch Cleat	Height = 13 in. Base 26 x 14.25 in.	16 x 1.125-in. dia.	Nom = 40*
30 Inch Cleat	Height = 13 in. Base 16 x 16in.	4 x 1.125-in. dia.	Nom = 20

* working capacity per barrel; from NAVFAC Draw. No. 1404464. Additional information concerning the sizes and working capacities of pier and wharf mooring fittings is found in Appendix A and in MIL-HDBK-1025/1.

D. Test Prerequisites

1. Berth adjacent to fitting to be tested shall be open
2. Prior to testing a review shall be conducted of the test equipment by qualified personnel to determine its adequacy for the loads to be applied
3. Fittings shall not exhibit outward signs of distress or failure prior to test

E. Test Preparation

1. Testing personnel shall provide test jigs, jacks, pumps, wire rope rigging, chain falls, dynamometer, as required to perform the test
2. Precautionary measures shall be taken to prevent damage to the fitting, dock structure, or fender system. Wood blocks, sheet copper, etc. shall be provided to prevent chafing and rope burns as necessary.
3. Monitoring points should be established on the fitting to track movement under load. Movement should be recorded in the three principal axes. A reference point independent of the fitting and its foundation should be established to find movement. Surveying methods can be employed to track movement from a safe distance. A target could be affixed to the fitting and readings taken (x, y, z) during the test.

F. Test Precautions

1. Standard shipyard safety precautions shall be observed by all test personnel
2. Provisions shall be made for keeping personnel not involved in the test clear of the test site and any danger areas

G. Test Procedure

1. Using the test jig, chain falls, dynamometer, etc. and a wire rope pendant, exert a horizontal pull equivalent to 110% of the rated load for the test fitting. Application of the load shall be 4 inches below the lip, horn, or other line holding device. The load shall be held for 10 minutes. At the end of 10 minutes, the fitting shall be examined for any evidence of failure. The results shall be recorded on the load test record sheet.

H. Testing Program

Various levels of testing can be instituted to achieve the desired results. For example, if it is determined that the required level of accuracy is 100%, then all fittings will need to be tested. If 95% accuracy is required, then the number of tests can be reduced significantly. The sampling criteria can be based on statistical sampling techniques. Statistical sampling provides an objective method for determining sample size for a desired confidence level and precision. The result of a statistical sampling program would determine the approximate number of fittings that are marginal or unacceptable; however, it would not be able to determine the location of those fittings. An estimation of the load carrying capacity and condition of the fittings in general could be made. Testing of every fitting would be required for 100% accuracy. A statistical approach may be a reasonable cost effective method of initiating a testing program that would determine the overall adequacy of the berthing system.

Standard sampling plans are presented in MIL-STD 414 or MIL-STD 105 based on choice of inspection methods; inspection by variables or by attributes. MIL-STD 105 may be well suited for a testing program where the fittings are either passing or failing the load test.

I. Existing Test Procedures

1. The drawing entitled, "Recommended Test Procedures-Deck Fitting Load Testing Berths 1 through 12,

Atlantic Division, Norfolk Naval Shipyard", Drawing 44S4.

The deck fitting test procedure as outlined and described on this plan is acceptable provided that the rigging has been reviewed and approved by qualified personnel for the loads applied. Also, the test loads shown on this plan should be adjusted based on the rated load for each fitting. The test load should be 110% of the rated load for the fitting. Dynamometer should be placed in direct line with the fitting to minimize frictional losses through sheaves.

Documentation of the tests should be on the provided Load Test Documentation Sheet.



APPENDIX C

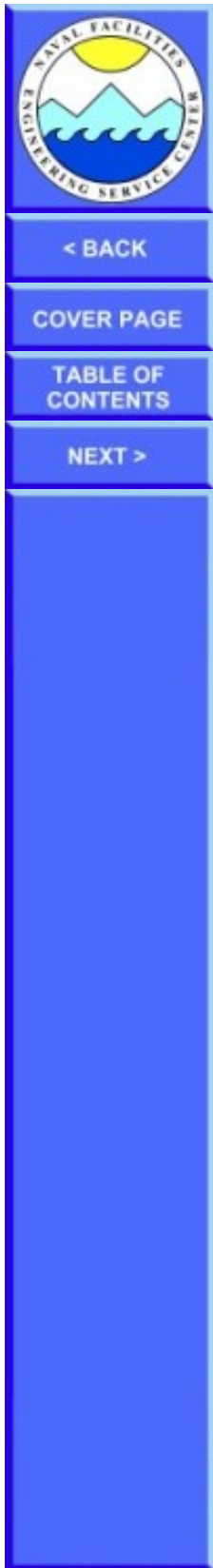
CALCULATIONS

The following are links to scanned pages of calculations and reference data:

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page 8	page 9	page 10	page 11	page 12	page 13	page 14
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or [Click here to browse through them in order.](#)

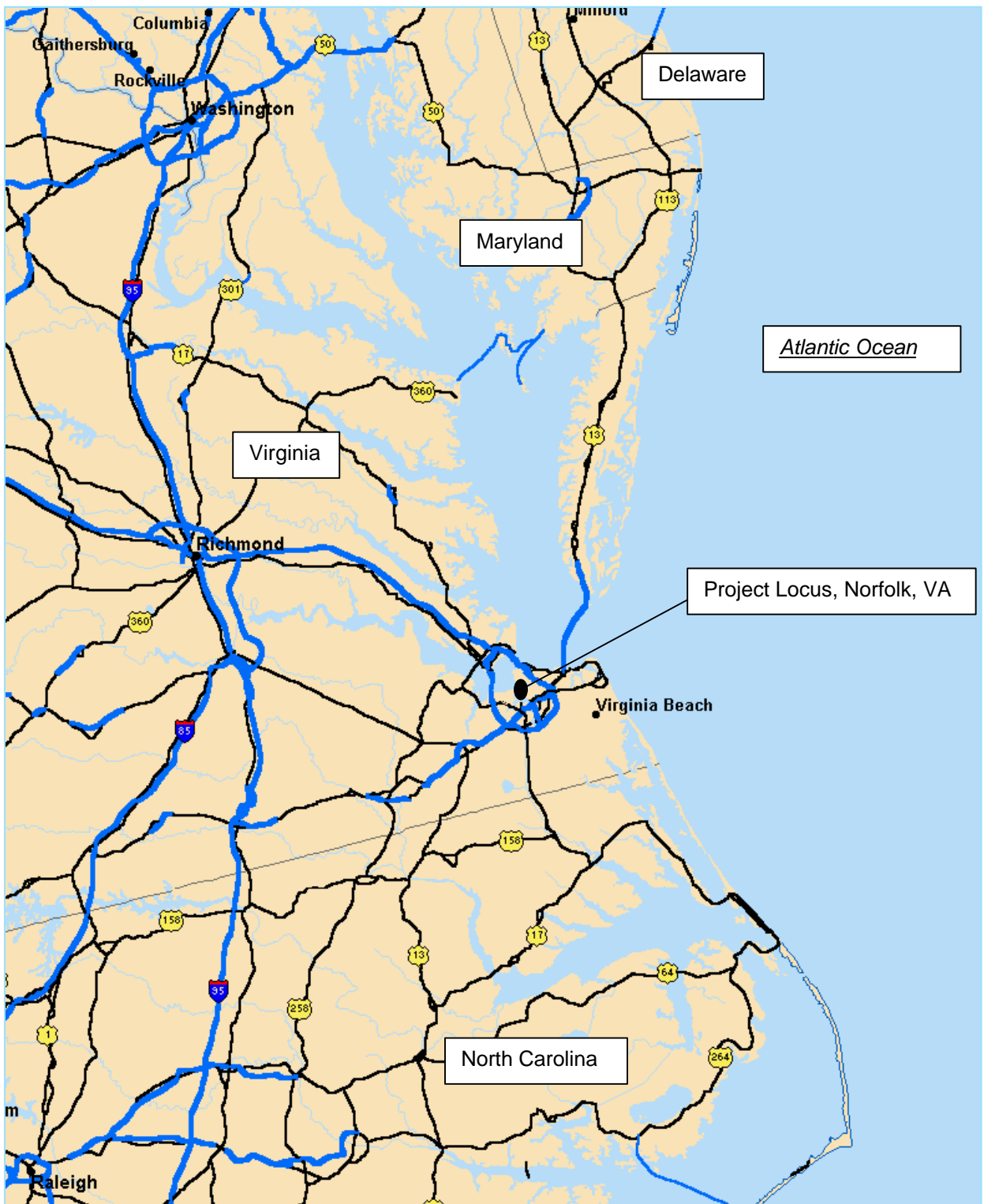




APPENDIX D

REFERENCES

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2. NAVFAC DM-25 Waterfront Operational Facilities, 1971.
3. Product Catalog, Blue Water Marine, Houston, Texas.
4. Guidelines for Preparation of Reports on Underwater Inspections of Waterfront Facilities, Naval Facilities Engineering Service Center, March, 1998.
5. Foundation Engineer Handbook, H.F. Winterkorn and H. Fang, 1975.



GRAPHIC SCALE

NONE

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MEDFIELD, MA

DATE: SEPTEMBER 1999

CONTRACT NUMBER
N47408-96-D-4058

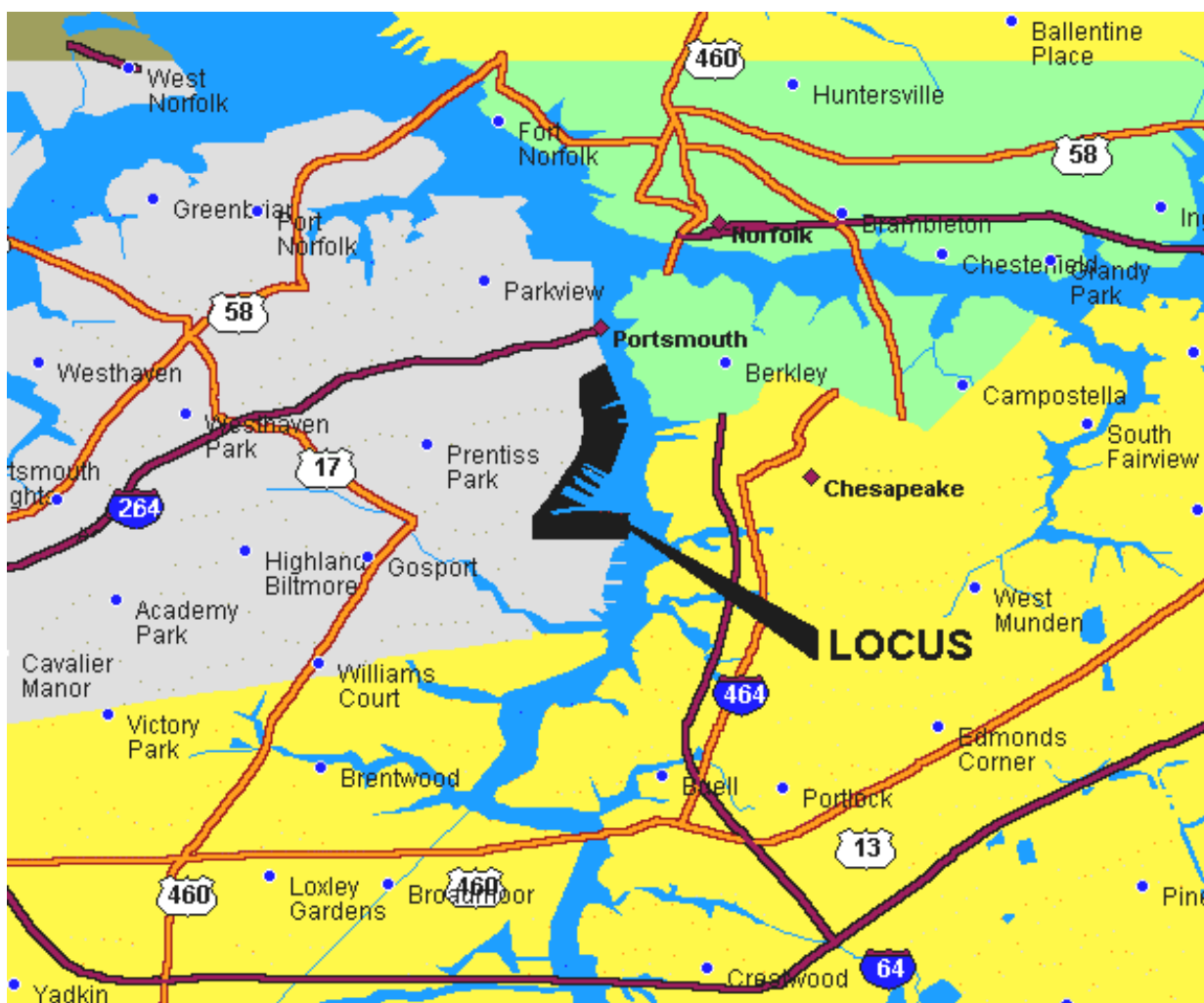
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NORFOLK NAVAL SHIPYARD PORTSMOUTH VIRGINIA

REGIONAL MAP



FIG.No.
2-1



GRAPHIC SCALE

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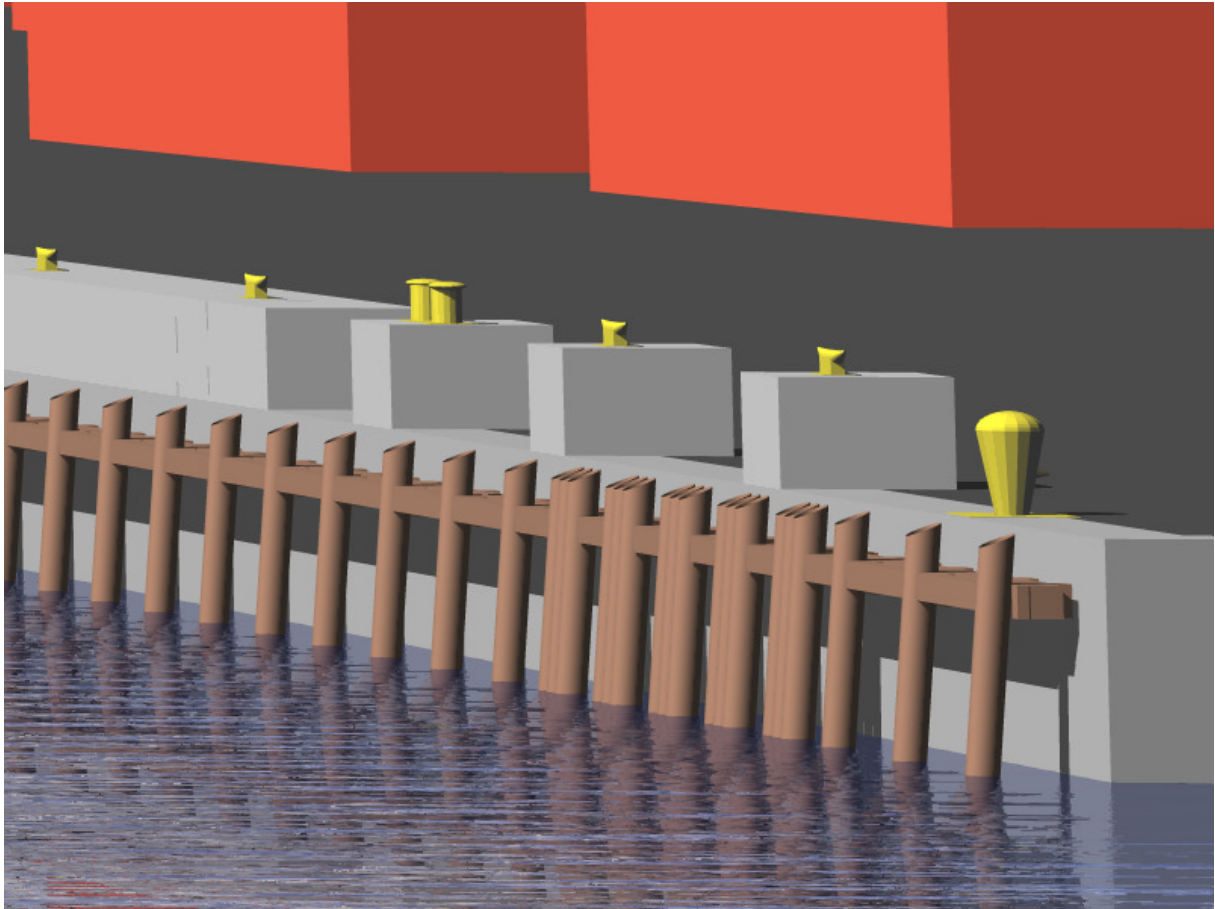
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AREA MAP



FIG.No.

2-2



GRAPHIC SCALE

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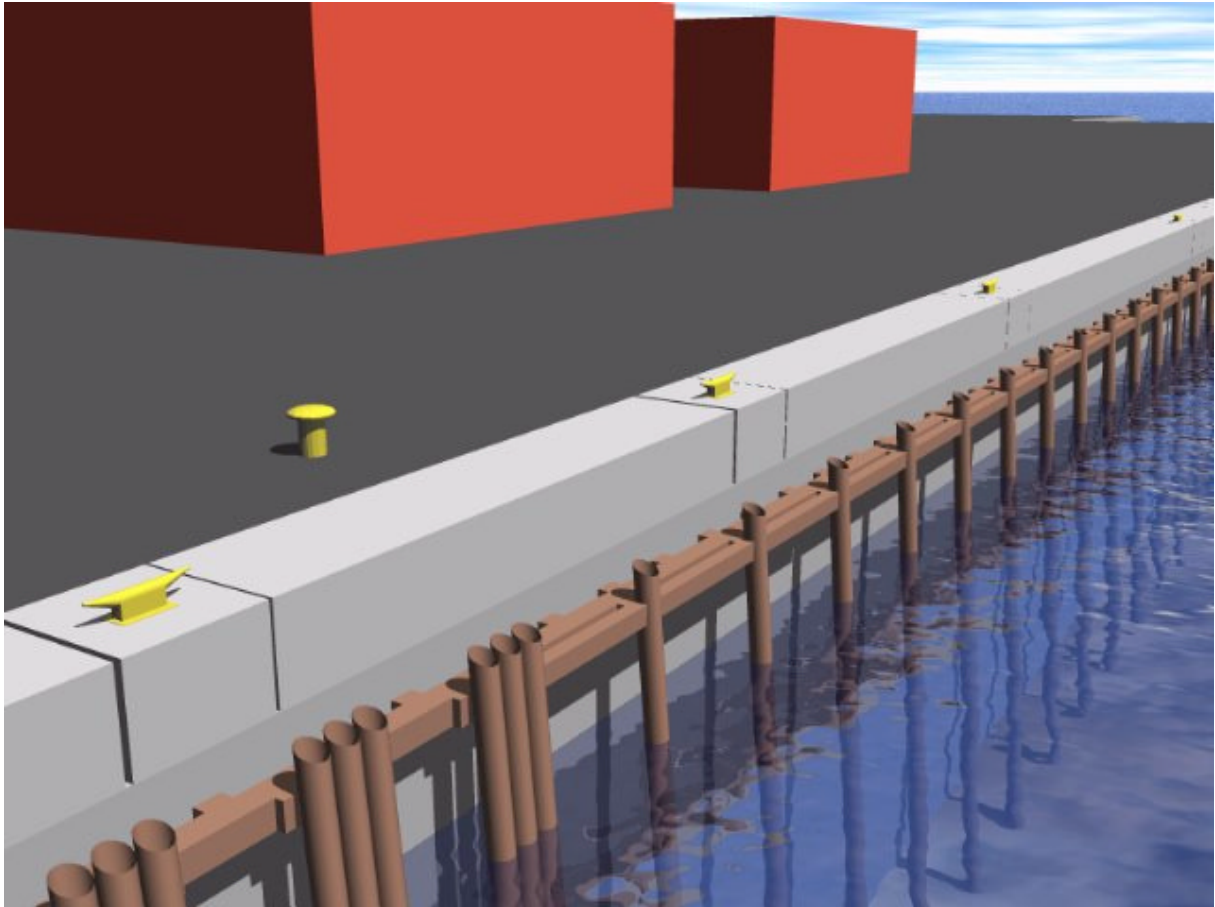
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NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA

BERTH 1
3-D MODEL EXAMPLE

FIG.No.

3-1A



GRAPHIC SCALE

NONE

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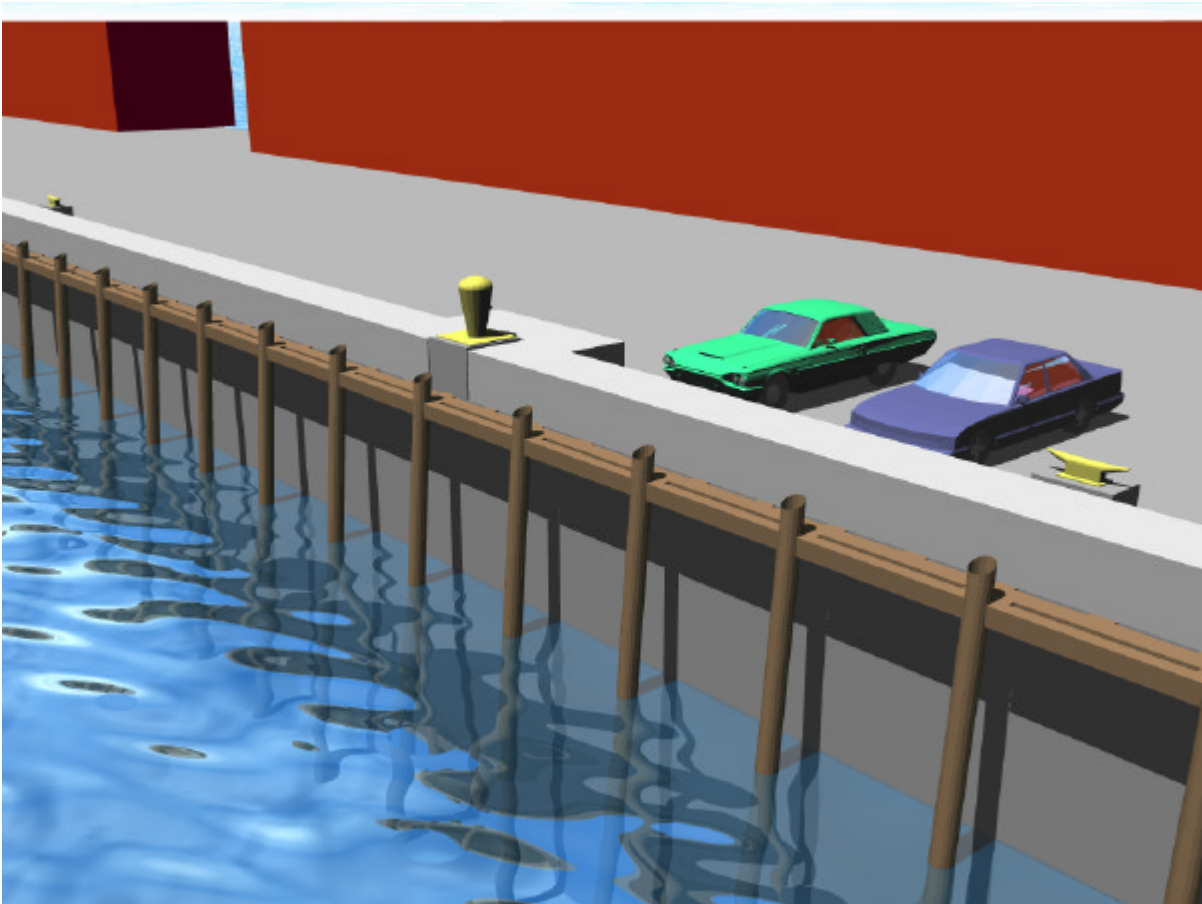
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NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA

BERTH 2
3-D MODEL EXAMPLE

FIG.No.

3-2A



GRAPHIC SCALE

NONE

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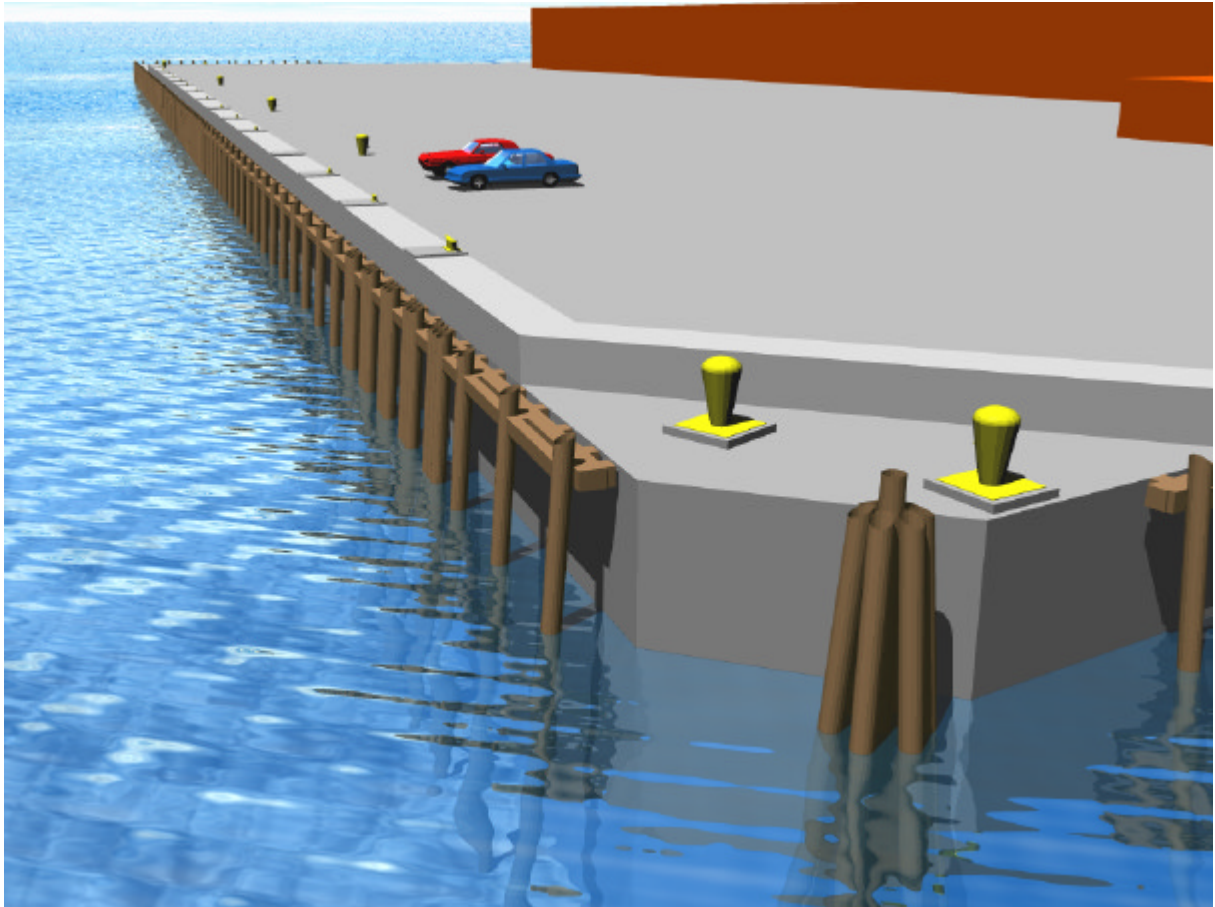
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NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA

BERTHS 3,4,5, & 6
3-D MODEL EXAMPLE

FIG.No.

3-3A



GRAPHIC SCALE

NONE

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MEDFIELD, MA

DATE: DECEMBER 1998

CONTRACT NUMBER
N47408-96-D-4058

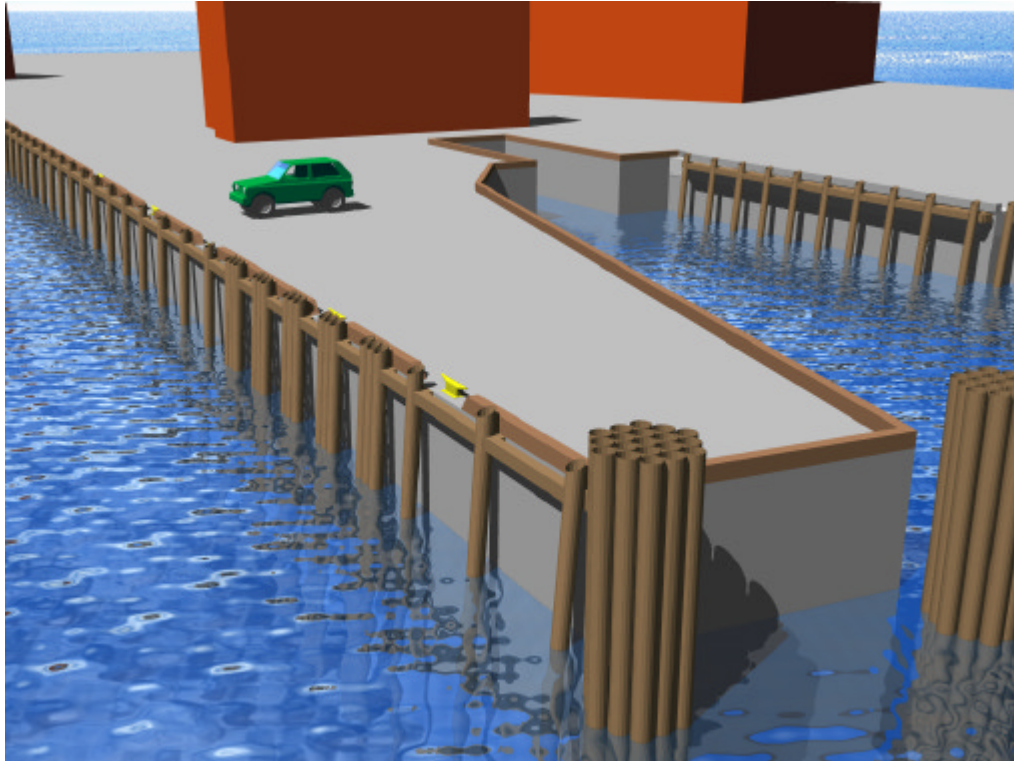
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NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA

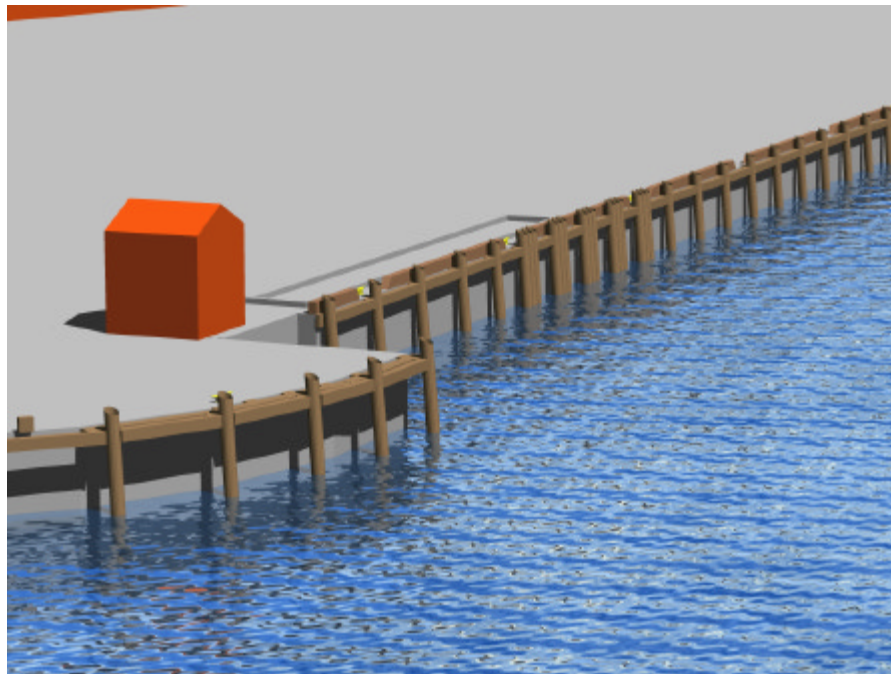
BERTHS 7 & 8
3-D MODEL EXAMPLE

FIG.No.

3-4A



Rendering above looking to the Northwest(Berth 9); below looking to the Southwest (Berth 10).



GRAPHIC SCALE

NONE

CHILDS ENGINEERING
CORPORATION BOX 333
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DATE: DECEMBER 1998

CONTRACT NUMBER
N47408-96-D-4058

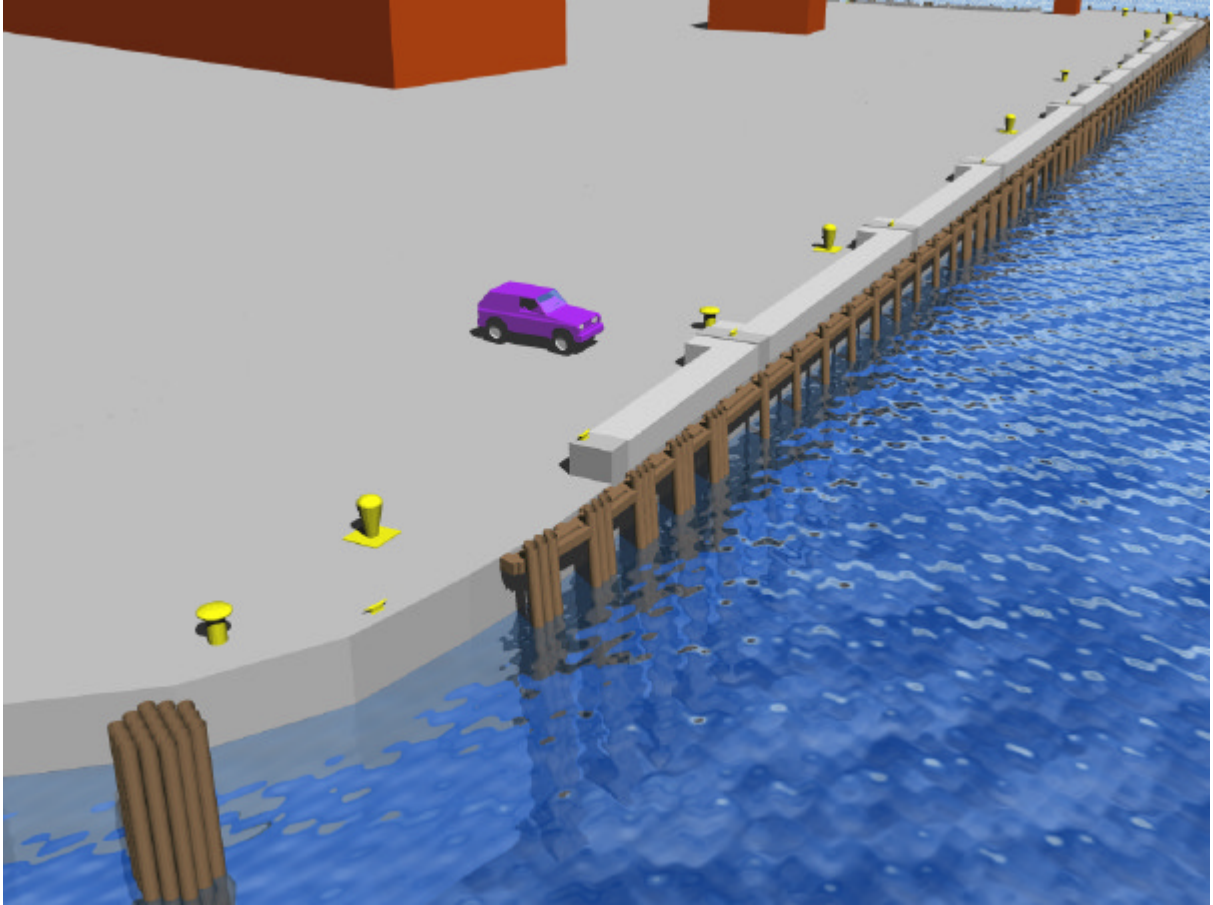
NAVAL FACILITIES ENGINEERING SERVICE CENTER
EAST COAST DETACHMENT
WASHINGTON, D.C.

NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA

BERTHS 9 & 10
3-D MODEL EXAMPLE

FIG.No.

3-5A



GRAPHIC SCALE

NONE

CHILDS ENGINEERING
CORPORATION BOX 333
MEDFIELD, MA

DATE: DECEMBER 1998

CONTRACT NUMBER
N47408-96-D-4058

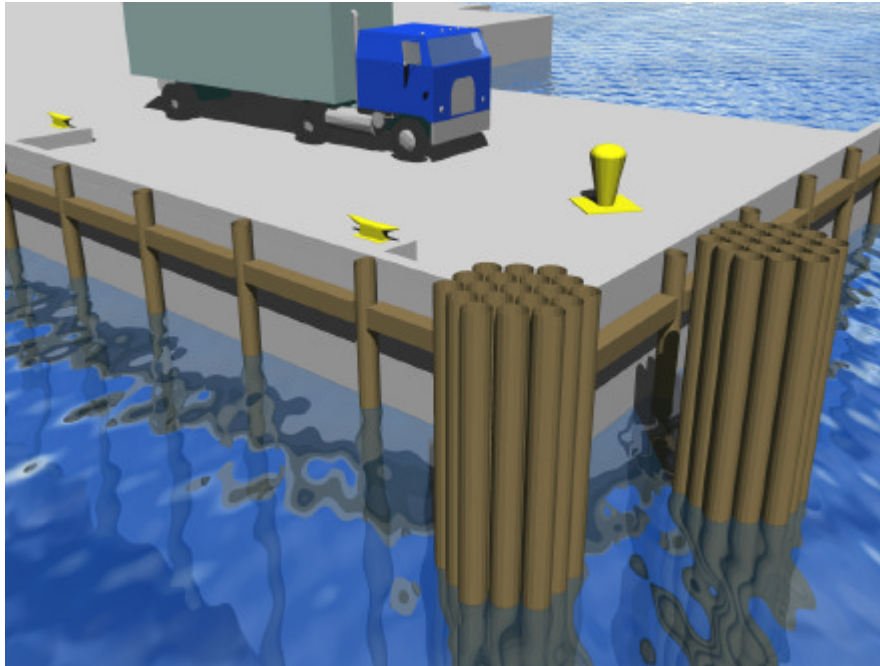
NAVAL FACILITIES ENGINEERING SERVICE CENTER
EAST COAST DETACHMENT
WASHINGTON, D.C.

NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA

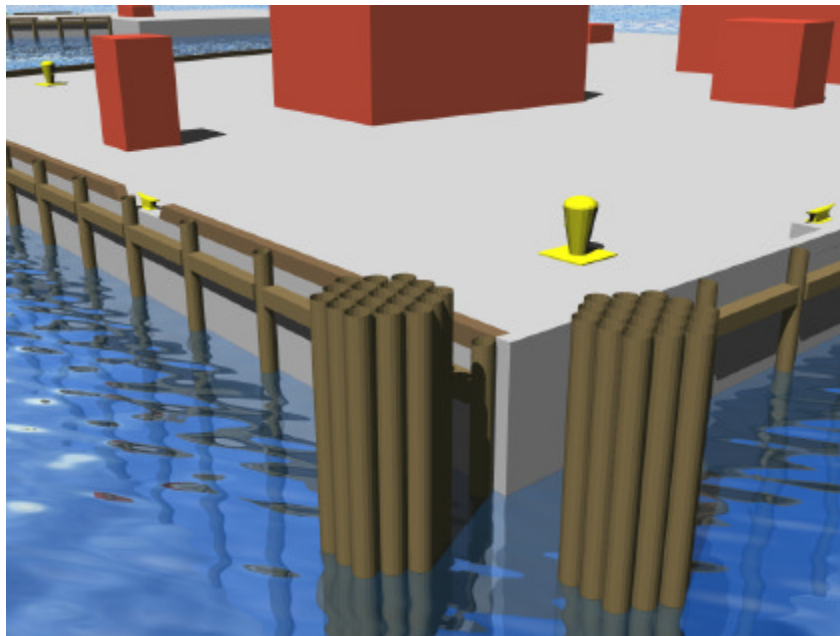
BERTHS 11 & 12
3-D MODEL EXAMPLE


FIG.No.

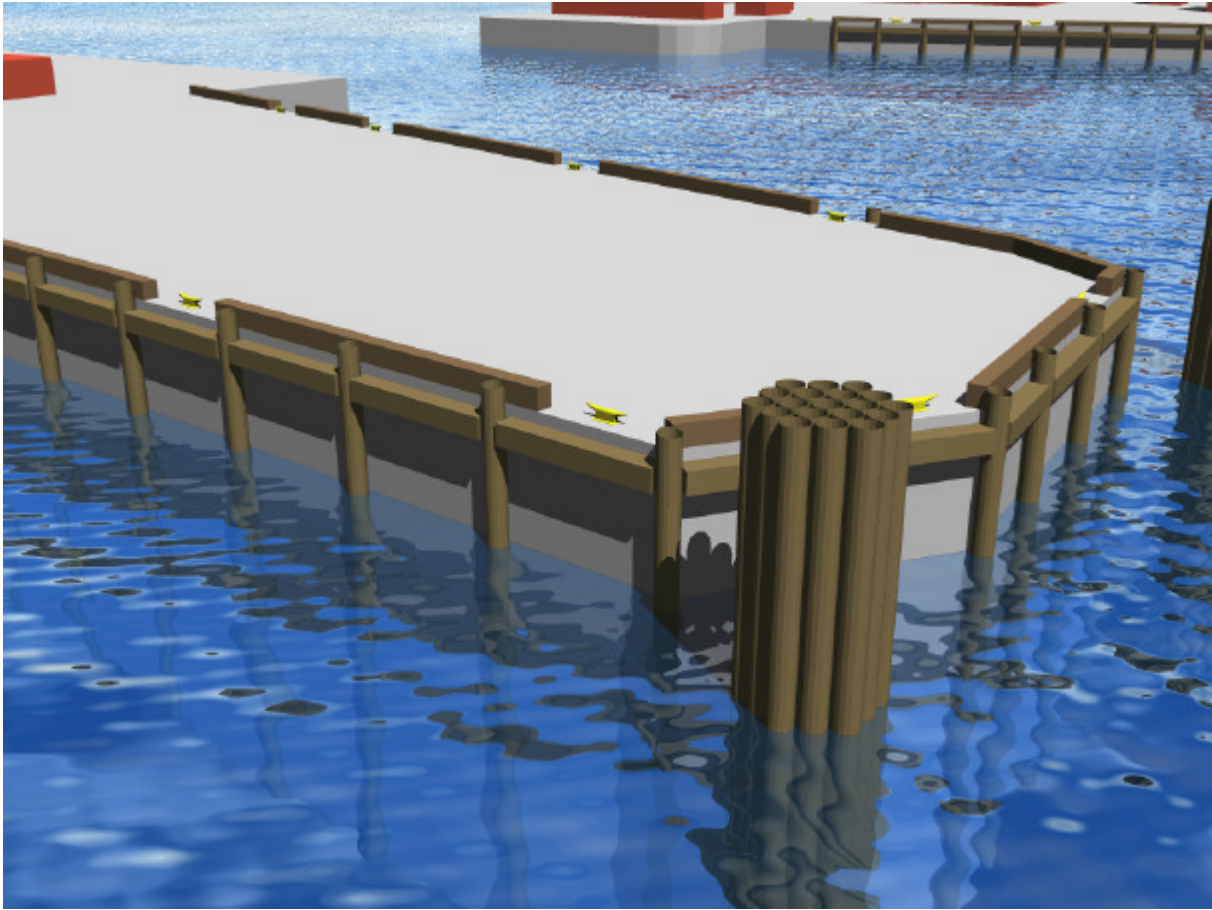
3-6A




Rendering above is looking to the Northwest at Berth 13; rendering below is looking to the Southwest at Berth 14.



	GRAPHIC SCALE		CHILDS ENGINEERING CORPORATION BOX 333 MEDFIELD, MA		NAVAL FACILITIES ENGINEERING SERVICE CENTER EAST COAST DETACHMENT WASHINGTON, D.C.	
	NONE		DATE: DECEMBER 1998		NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA	
			CONTRACT NUMBER N47408-96-D-4058		BERTHS 13, 14, 15, 16, & 17 3-D MODEL EXAMPLE	
					FIG.No.	3-7A

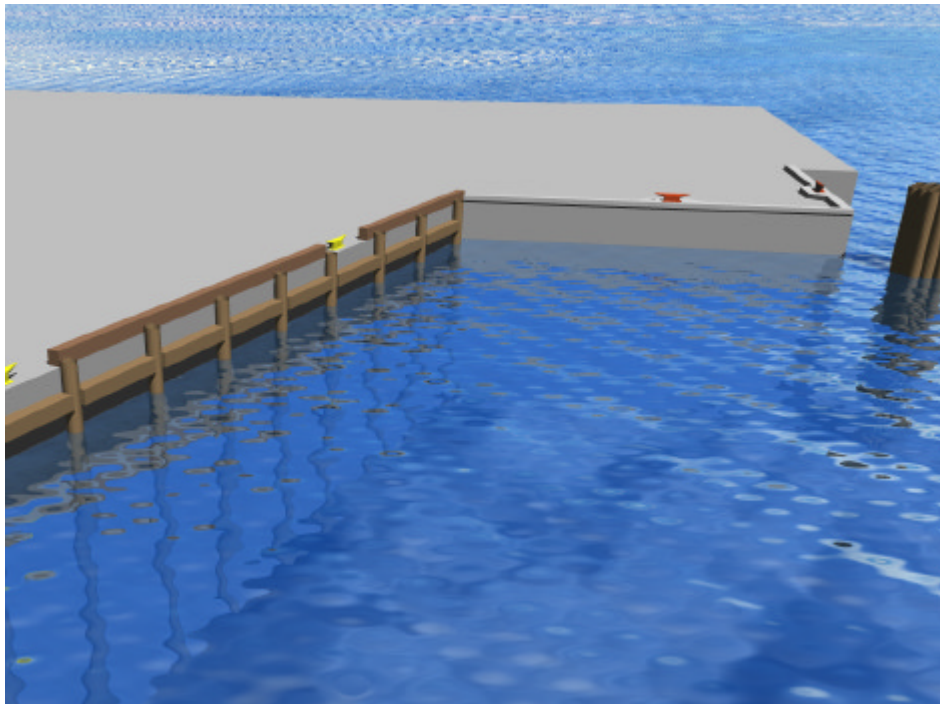


Rendered view of Berths 16 & 17 looking Northwest.

	GRAPHIC SCALE	CHILDS ENGINEERING CORPORATION BOX 333 MEDFIELD, MA	NAVAL FACILITIES ENGINEERING SERVICE CENTER EAST COAST DETACHMENT WASHINGTON, D.C.	
	NONE	DATE: DECEMBER 1998 CONTRACT NUMBER N47408-96-D-4058	NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA BERTHS 13, 14, 15, 16, & 17 3-D MODEL EXAMPLE	FIG.No. 3-7B



Rendering above is looking to the Northwest at Berths 18 & 19;
 rendering below is looking to the Southwest at Berth 20



GRAPHIC SCALE

NONE

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DATE: DECEMBER 1998

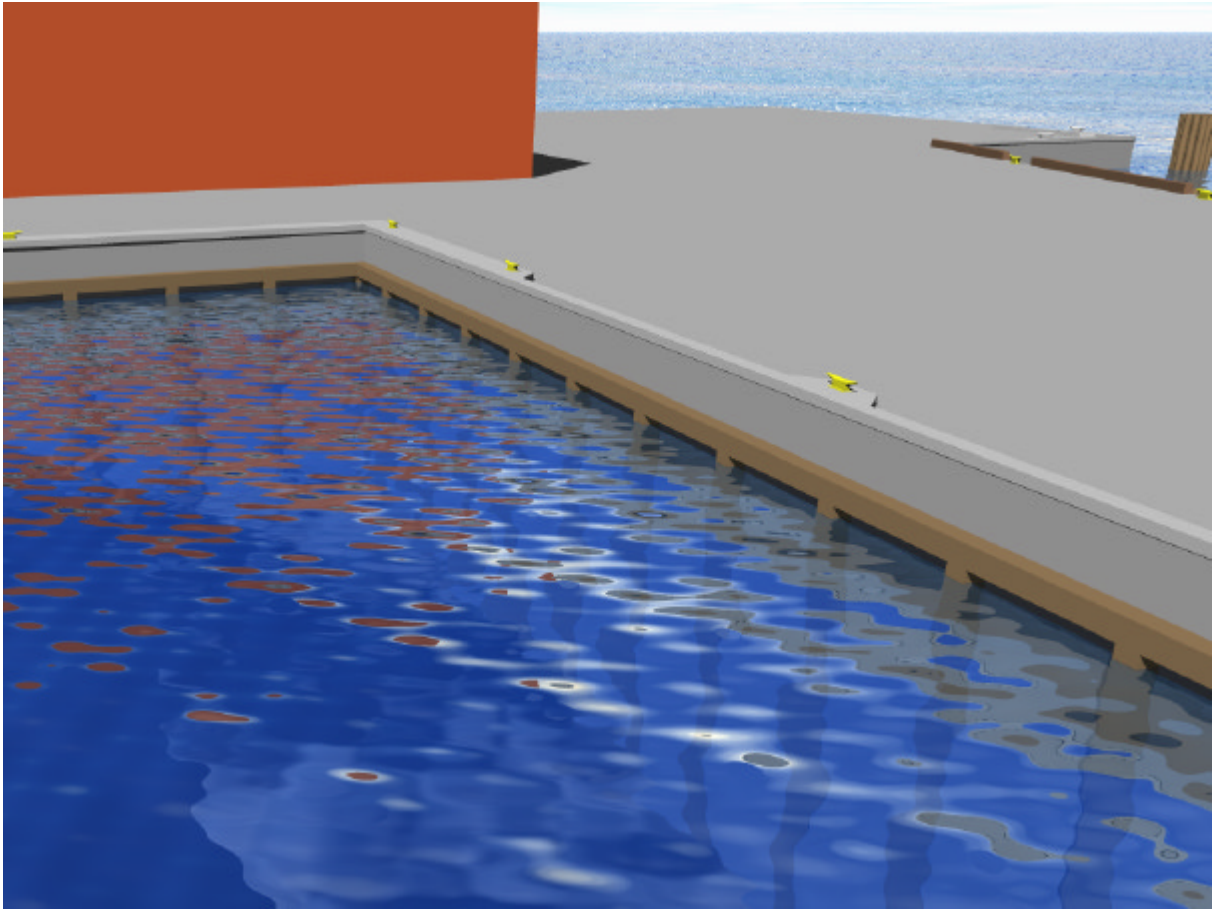
CONTRACT NUMBER
 N47408-96-D-4058

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 WASHINGTON, D.C.


NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA
BERTHS 18, 19,20 & Barge Basin
3-D MODEL EXAMPLE

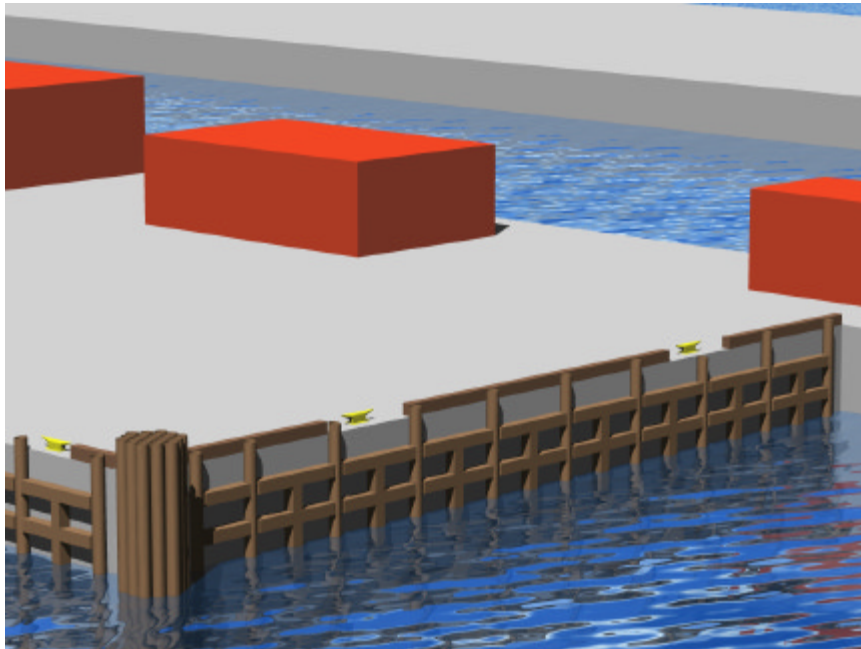
FIG.No.

3-8A

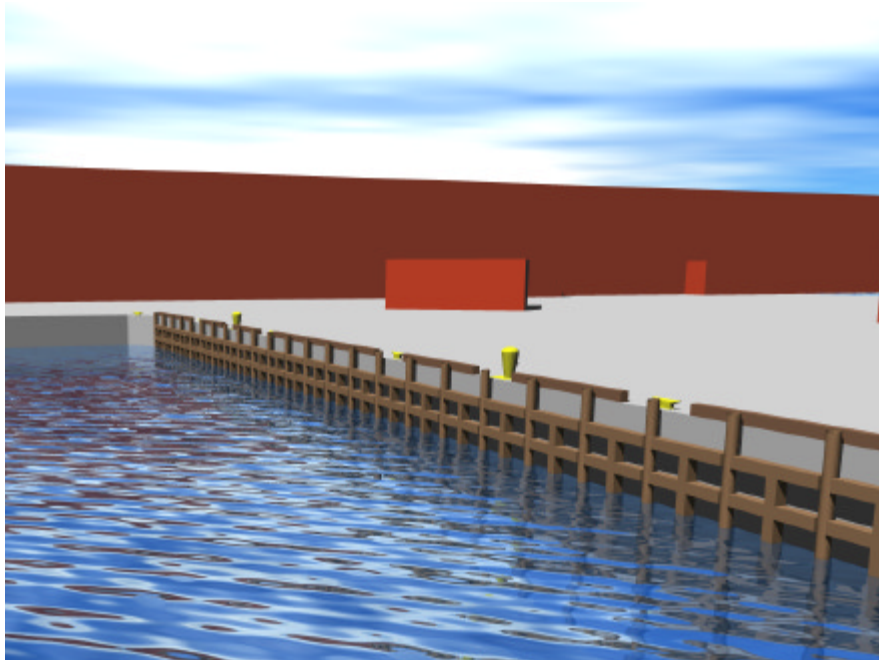


Rendered view of Berth 20 looking Northwest.

	GRAPHIC SCALE		CHILDS ENGINEERING CORPORATION BOX 333 MEDFIELD, MA		NAVAL FACILITIES ENGINEERING SERVICE CENTER EAST COAST DETACHMENT WASHINGTON, D.C.	
	NONE		DATE: DECEMBER 1998		NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA	
			CONTRACT NUMBER N47408-96-D-4058		BERTHS 18, 19,20 & Barge Basin 3-D MODEL EXAMPLE	
				FIG.No.		3-8B



Rendering above is looking to the Northwest at Berth 22; rendering below is looking to the West at Berth 24



GRAPHIC SCALE

NONE

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CORPORATION BOX 333
MEDFIELD, MA

DATE: DECEMBER 1998

CONTRACT NUMBER
N47408-96-D-4058

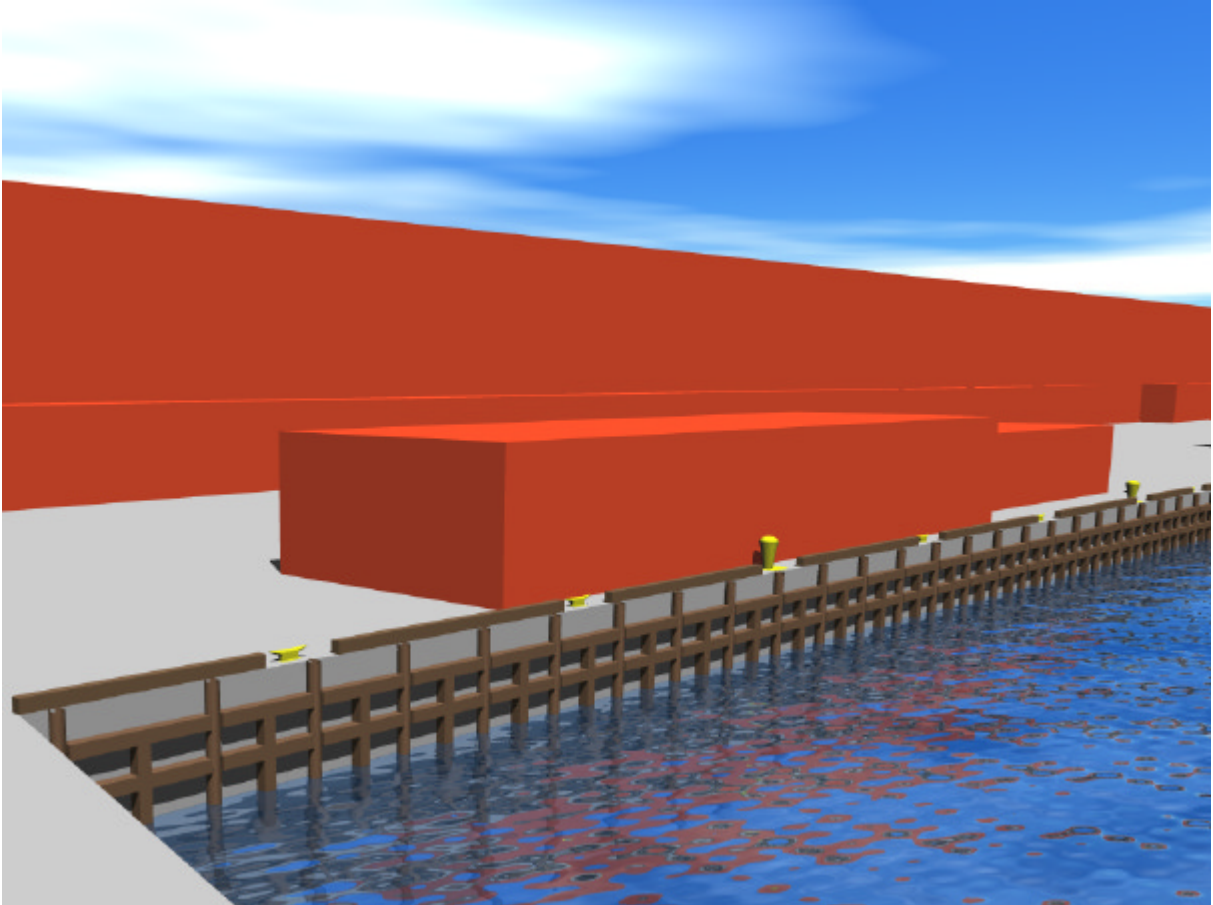
NAVAL FACILITIES ENGINEERING SERVICE CENTER
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NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA

BERTHS 22 23 & 24
3-D MODEL EXAMPLE

FIG.No.

3-9A



GRAPHIC SCALE

NONE

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CORPORATION BOX 333
MEDFIELD, MA

DATE: DECEMBER 1998

CONTRACT NUMBER
N47408-96-D-4058

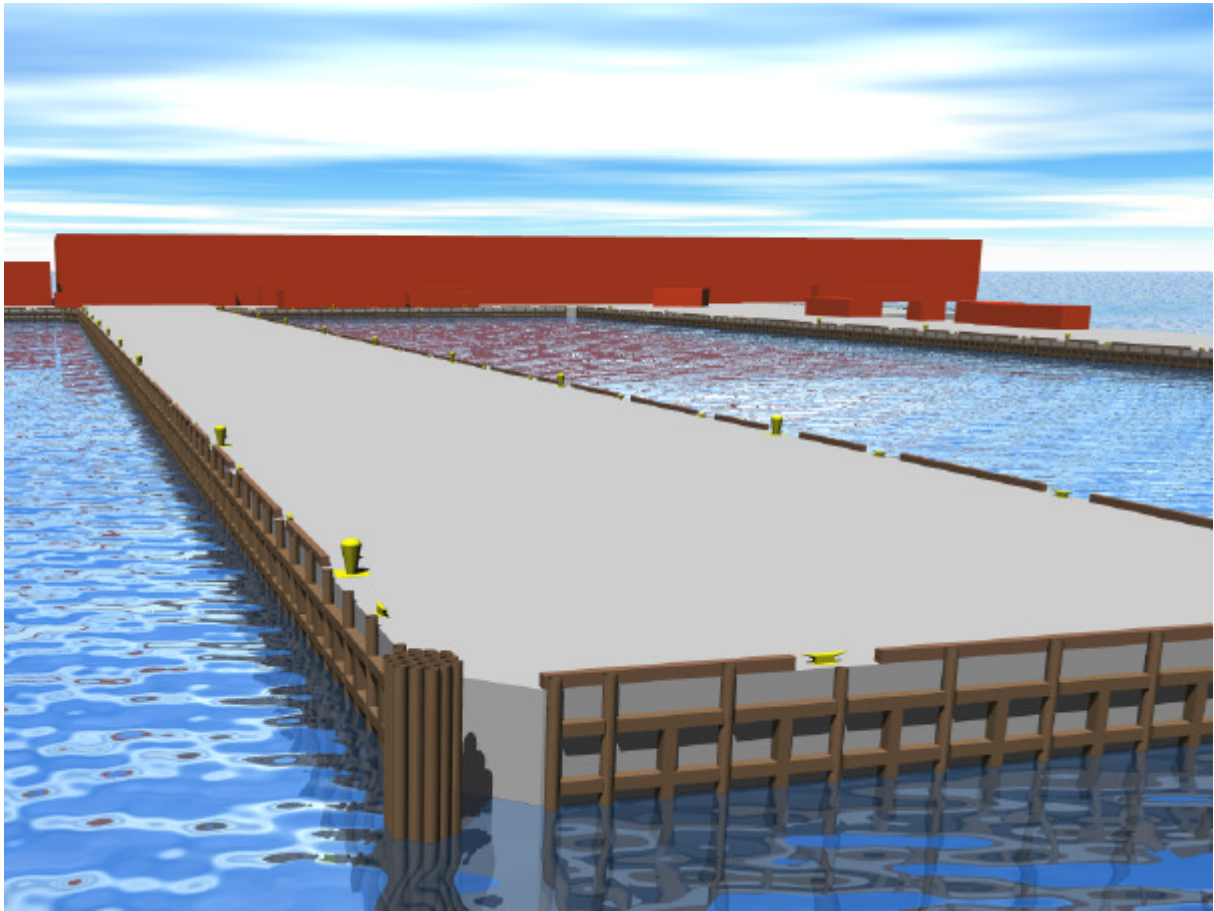
NAVAL FACILITIES ENGINEERING SERVICE CENTER
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NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA

BERTH 25
3-D MODEL EXAMPLE

FIG.No.

3-10A



GRAPHIC SCALE

NONE

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DATE: DECEMBER 1998

CONTRACT NUMBER
N47408-96-D-4058

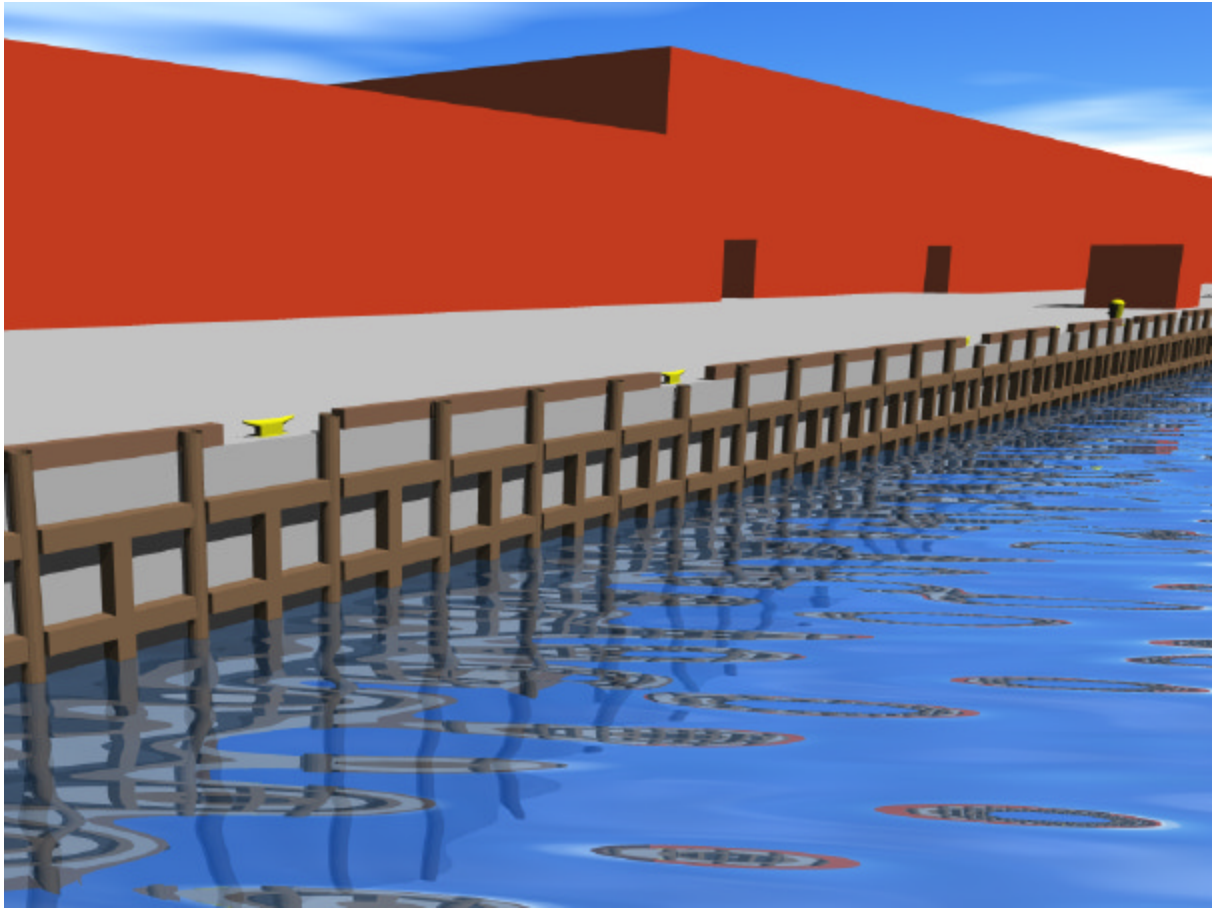
NAVAL FACILITIES ENGINEERING SERVICE CENTER
EAST COAST DETACHMENT
WASHINGTON, D.C.

NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA

BERTHS 26 TO 30
3-D MODEL EXAMPLE

FIG.No.

3-11A



GRAPHIC SCALE

NONE

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MEDFIELD, MA

DATE: DECEMBER 1998

CONTRACT NUMBER
N47408-96-D-4058

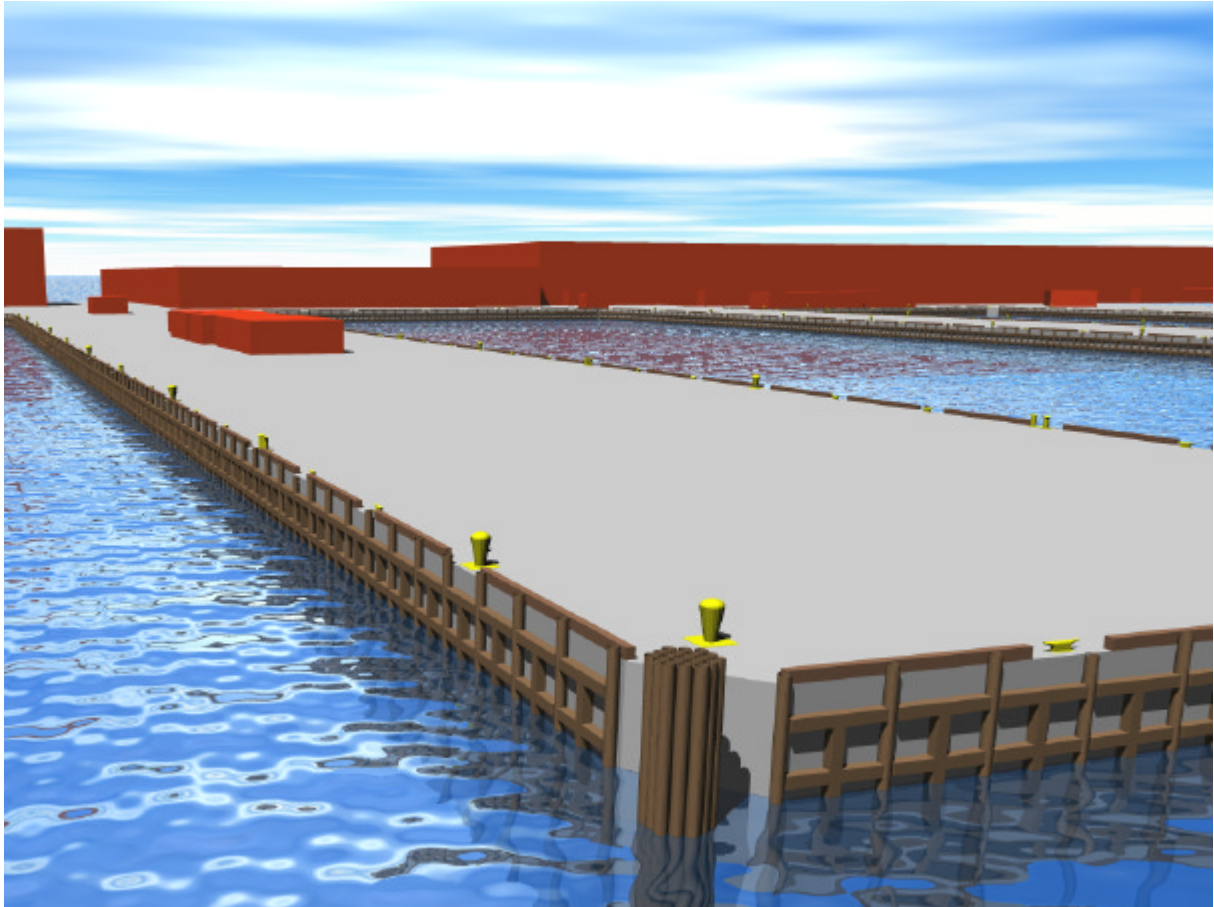
NAVAL FACILITIES ENGINEERING SERVICE CENTER
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NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA

BERTHS 31
3-D MODEL EXAMPLE

FIG.No.

3-12A



GRAPHIC SCALE

NONE

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CORPORATION BOX 333
MEDFIELD, MA

DATE: DECEMBER 1998

CONTRACT NUMBER
N47408-96-D-4058

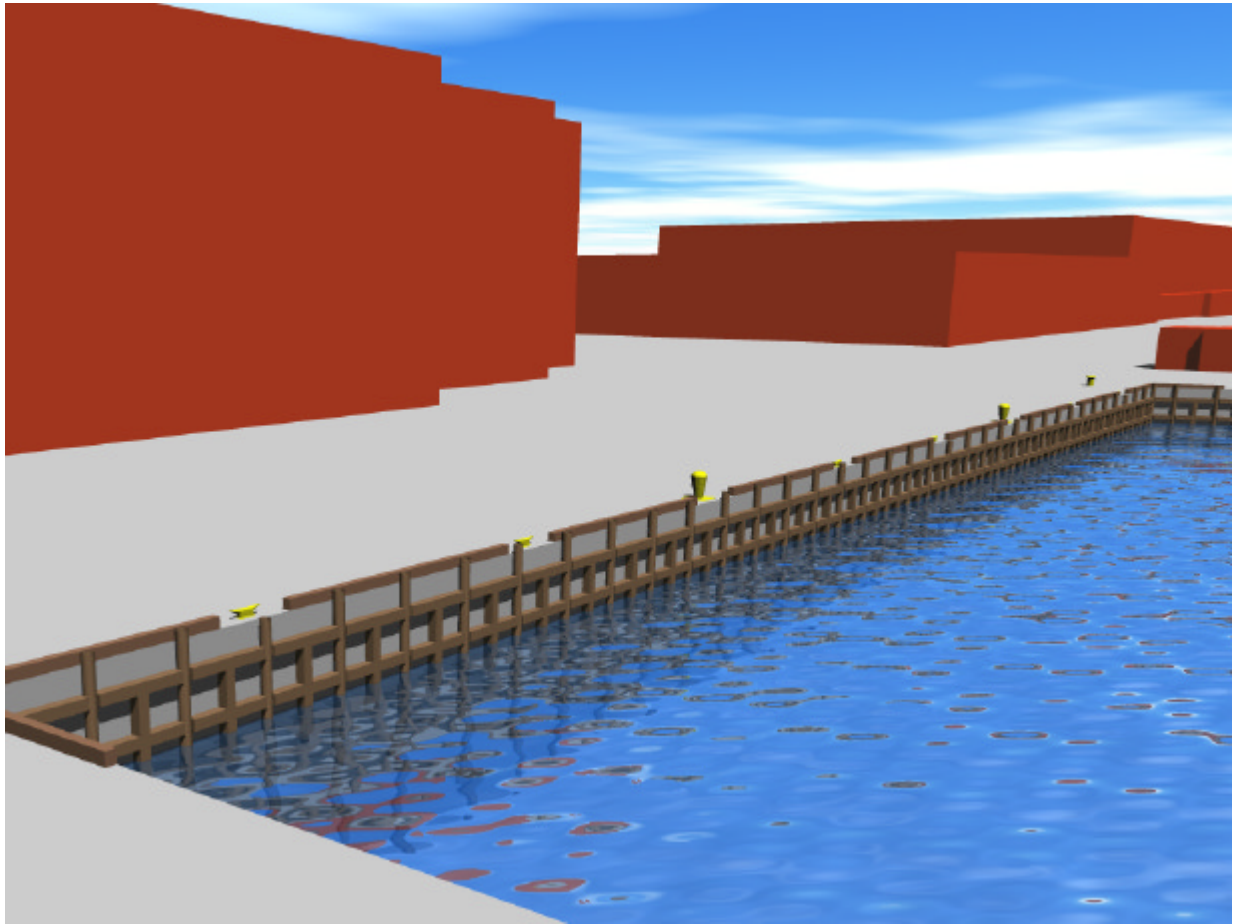
NAVAL FACILITIES ENGINEERING SERVICE CENTER
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NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA

BERTHS 32 TO 36
3-D MODEL EXAMPLE

FIG.No.

3-13A



GRAPHIC SCALE

NONE

CHILDS ENGINEERING
CORPORATION BOX 333
MEDFIELD, MA

DATE: DECEMBER 1998

CONTRACT NUMBER
N47408-96-D-4058

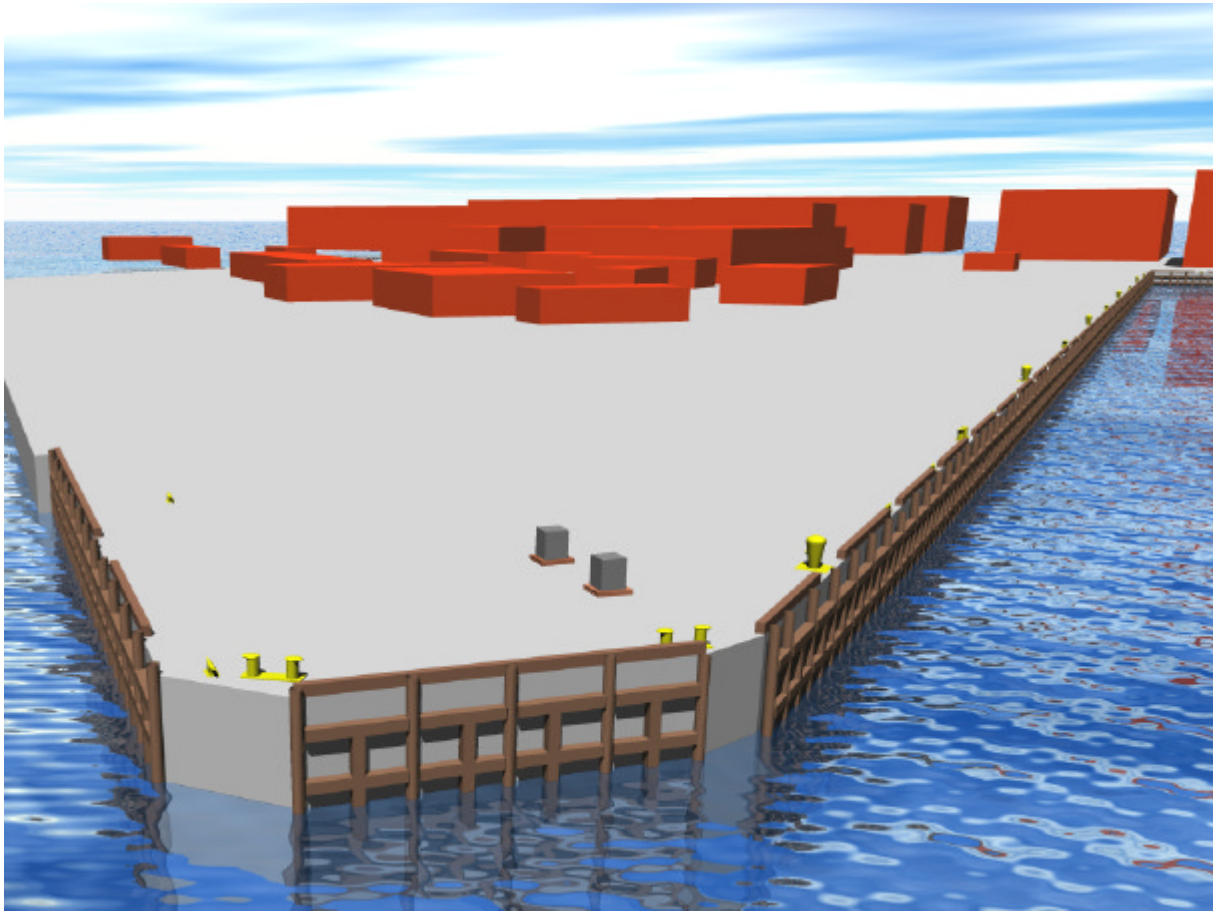
NAVAL FACILITIES ENGINEERING SERVICE CENTER
EAST COAST DETACHMENT
WASHINGTON, D.C.

NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA

BERTH 37
3-D MODEL EXAMPLE

FIG.No.

3-14A



GRAPHIC SCALE

NONE

CHILDS ENGINEERING
CORPORATION BOX 333
MEDFIELD, MA

DATE: DECEMBER 1998

CONTRACT NUMBER
N47408-96-D-4058

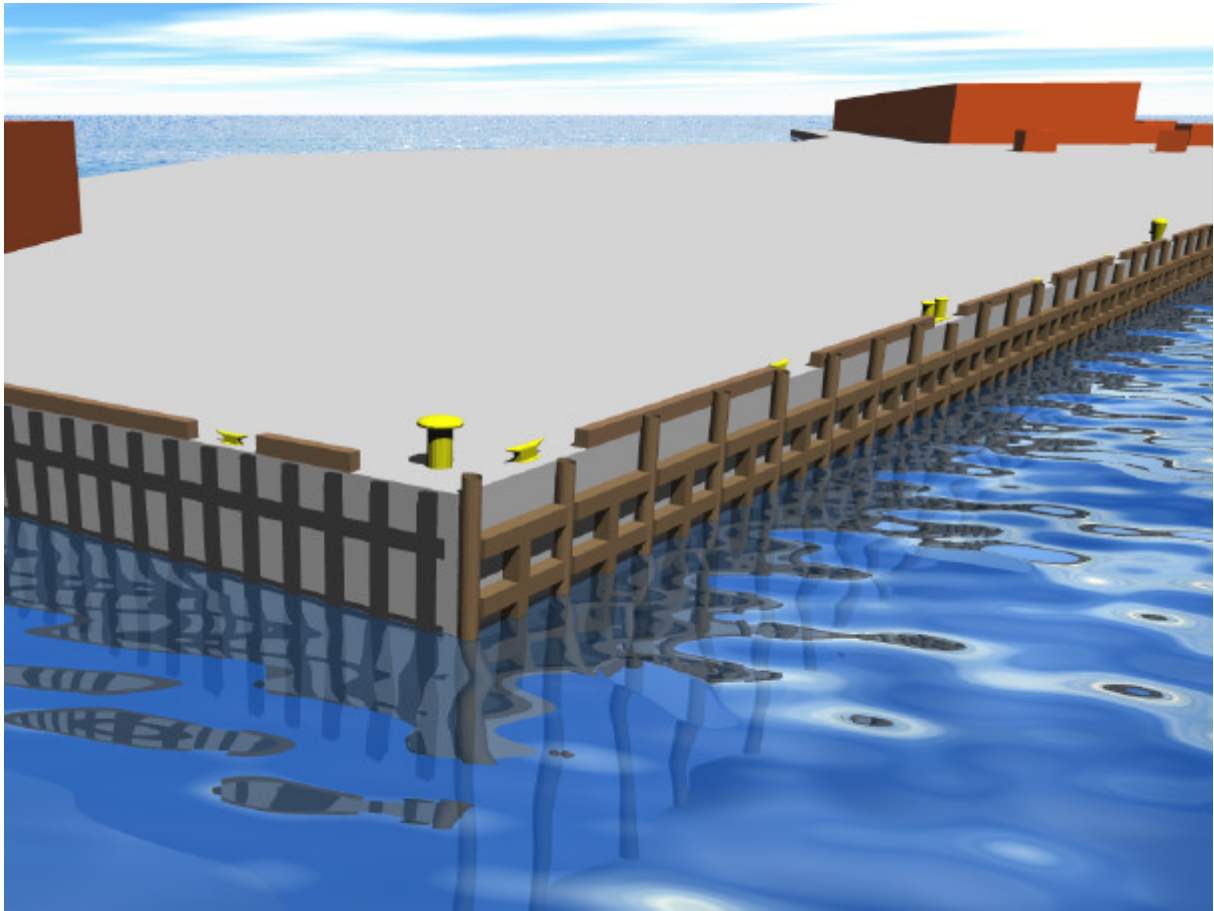
NAVAL FACILITIES ENGINEERING SERVICE CENTER
EAST COAST DETACHMENT
WASHINGTON, D.C.

NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA

BERTHS 38, 39, & 40
3-D MODEL EXAMPLE

FIG.No.

3-15A



GRAPHIC SCALE

NONE

CHILDS ENGINEERING
CORPORATION BOX 333
MEDFIELD, MA

DATE: DECEMBER 1998

CONTRACT NUMBER
N47408-96-D-4058

NAVAL FACILITIES ENGINEERING SERVICE CENTER
EAST COAST DETACHMENT
WASHINGTON, D.C.

NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA

BERTHS 41, 42, & 43
3-D MODEL EXAMPLE

FIG.No.

3-16A



Page 1



CHILDS ENGINEERING CORPORATION

Waterfront and Structural Engineering

BOX 333, MEDFIELD, MA 02052

JOB 123796, II NNSY

SHEET NO. 1 OF 26

CALCULATED BY CDS DATE 9/98

CHECKED BY EARL DATE 12/14/98

SCALE _____

NNSY MOORING CONDITION REPORT

DETERMINE APPROXIMATE ALLOWABLE MOORING AND BERTHING
LOADS AT PIER FACILITIES IN THE NORFOLK NAVAL SHIPYARD.

CONSIDER THE FOLLOWING ASSUMPTIONS:

1. PIER STRUCTURES AT MANY BERTHS ARE
SIMILAR, I.E. TIMBER PILE SUPPORTED RELIEVING
PLATFORMS WITH CONCRETE SHEET PILE FACE.
2. TO SIMPLIFY THE ANALYSIS A TYPICAL SOIL
PROFILE IS ASSUMED TO BE A LAYER OF SAND.



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CHILDS ENGINEERING CORPORATION

Waterfront and Structural Engineering

BOX 333, MEDFIELD, MA 02052

 JOB NMSY MOORING FITTING COND.

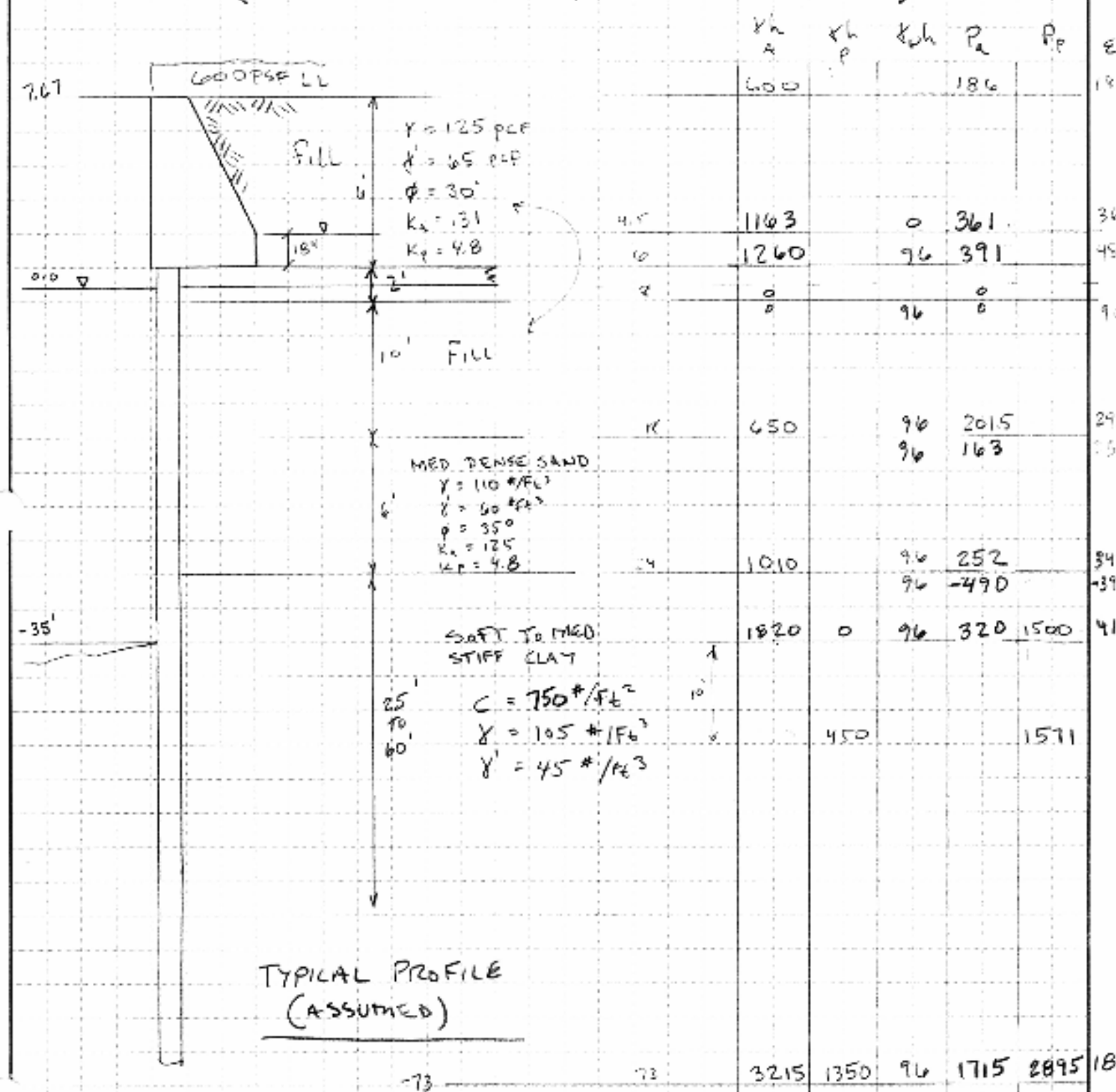
 SHEET NO. 2 OF 26

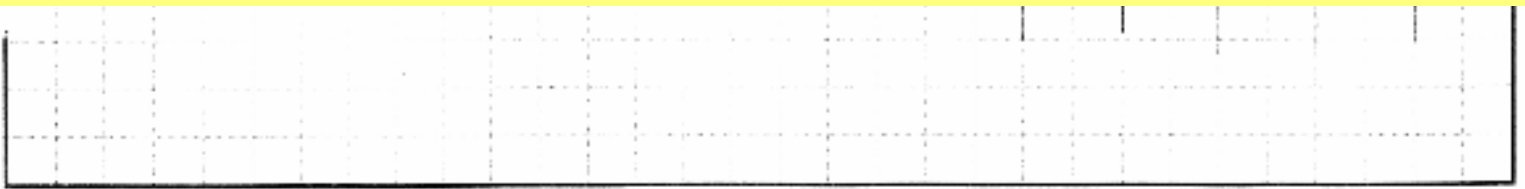
 CALCULATED BY CDS DATE 8/98

 CHECKED BY PAFL DATE 12/14/98

SCALE _____

FIND "T" (LATERAL LOAD RESULTING FROM SOIL PRESSURE)





2000/07/20-1 (Single Sheet) S/C (Product)

C-3

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[NEXT PAGE](#)



CHILDS ENGINEERING CORPORATION

Waterfront and Structural Engineering

BOX 333, MEDFIELD, MA 02052

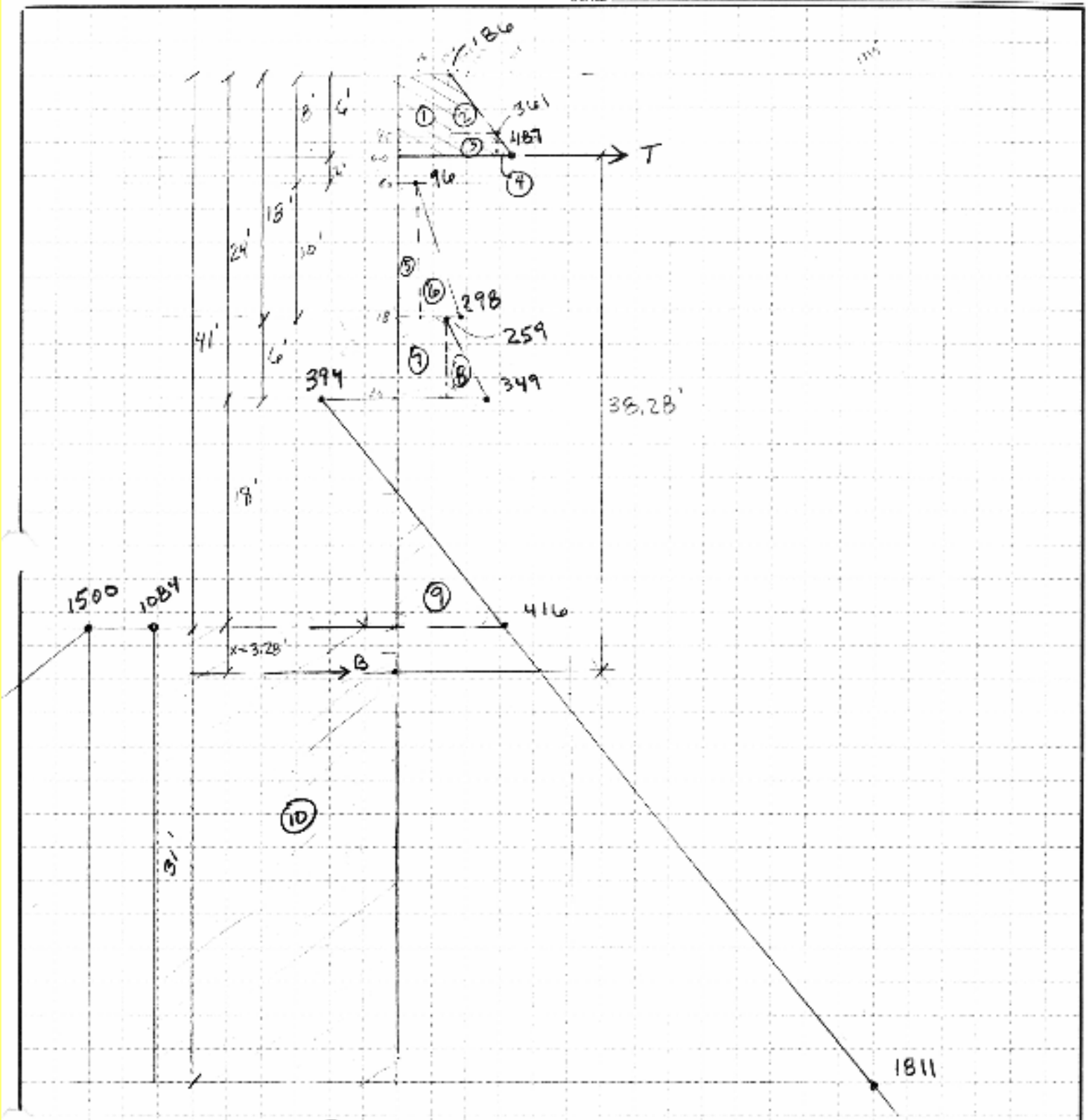
JOB 133796

SHEET NO. 3 OF 26

CALCULATED BY CDS DATE 8/98

CHECKED BY PAZ DATE 12/14/98

SCALE _____



Soil Pressure Diag.

PRODUCT 1001 (Single Sheet) 22x11 (Portrait)

C-4

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CHILDS ENGINEERING CORPORATION

Waterfront and Structural Engineering

BOX 333, MEDFIELD, MA 02052

 JOB 133796.11 M-454

 SHEET NO. 4 OF 24

 CALCULATED BY CDS DATE 8/98

 CHECKED BY PAZ DATE 12/14/98

SCALE _____

SUM MOMENTS @ T

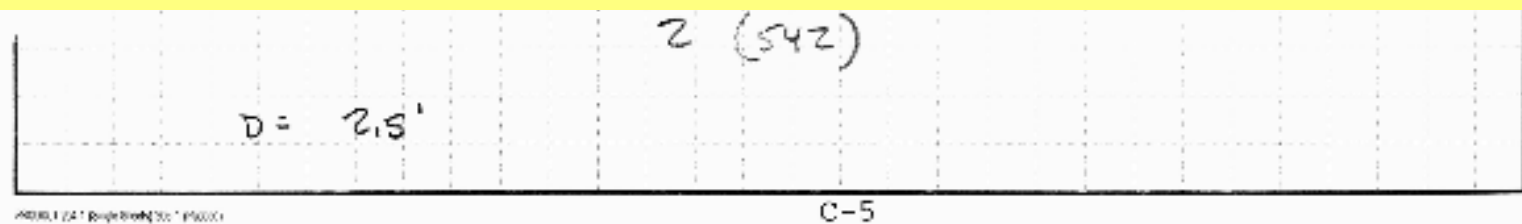
	ARM	MOMENT
① $186 (6) = 1116$	3'	- 3348
② $\frac{1}{2} 4.5 175 = 394$	3	- 1182
③ $1.5 175 = 263$.75	- 197
④ $\frac{1}{2} 1.5 126 = 95$.5	- 48
⑤ $96 (10) = 960$	7	+ 6720
⑥ $\frac{1}{2} 10 202 = 1010$	8.7	+ 8787
⑦ $259 (6) = 1554$	15	+ 23310
⑧ $\frac{1}{2} (6) (90) = 270$	16	+ 4320
⑨ $\frac{1}{2} (416) 9.2 = 1914$	32.9	+ 62971
⑩ $1084 (D) = 1084D$	$36 + \frac{D}{2}$	- $39024D - 542D^2$

SOLVE FOR D (DEPTH OF PENETRATION)

$$0 = -4775 + 106,108 - 39024D - 542D^2$$

$$0 = 542D^2 + 39024D - 101333$$

$$D = \frac{-39024 \pm \sqrt{39024^2 + 4(542)(101333)}}{2(542)}$$



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CHILDS ENGINEERING CORPORATION

Waterfront and Structural Engineering

BOX 333, MEDFIELD, MA 02052

JOB 123796.11 WNSY

SHEET NO. 5 OF 26

CALCULATED BY CDS DATE 8/98

CHECKED BY MAZ DATE 12/14/98

SCALE _____

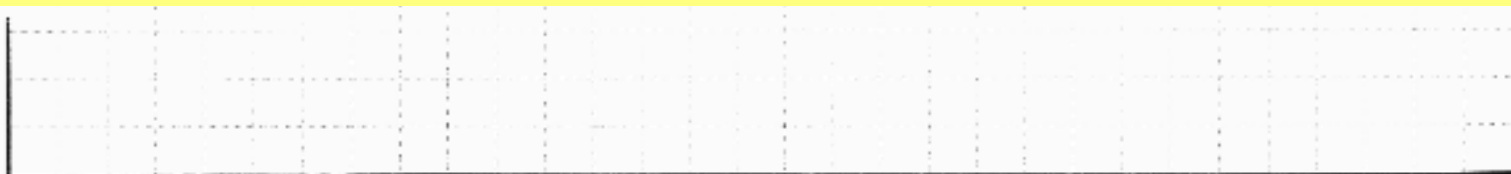
FIND T BY SUMMING FORCES.

$$T = P_A - P_T$$

$$T = 1116 + 394 + 263 - 95 + 960 + 1010 + 1554 + 270 + 1914$$

$$- 1084 (2.5)$$

$$T = 4866 \text{ # / LF}$$



PROJECT 204 - (Sage Group) 304 - (P0000)

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CHILDS ENGINEERING CORPORATION

Waterfront and Structural Engineering

BOX 333, MEDFIELD, MA 02052

JOB 133756.11 NMS

SHIFT NO. 6 OF 26

CALCULATED BY CDS DATE 8/98

CHECKED BY 13112 DATE 12/14/98

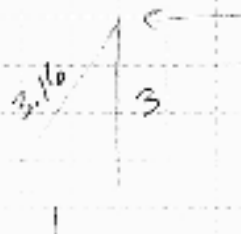
SCALE

FIND RESISTANCE OF BATTER PILES :

ASSUME PILES DRIVEN TO 20 T CAPACITY

BAT PILES @ 1:3 SLOPE

By SIMILAR TRIANGLES :



$$\frac{1}{3.16} = \frac{x}{20}$$

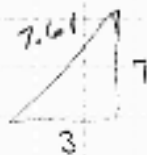
$$x = 6.32 \text{ T LATERAL}$$

$$\frac{3}{3.16} = \frac{x}{20}$$

$$x = 18.98 \text{ T UPLIFT / PILE}$$

BAT PILES @ 3:7

By SIMILAR TRIANGLES :



$$\frac{3}{7.61} = \frac{x}{20}$$

$$x = 7.87 \text{ LATERAL}$$

$$\frac{7}{7.61} = \frac{x}{20}$$

$$x = 18.38 \text{ UPLIFT}$$



PROJECT 101 - Bridge Street (2011 - 2012)

C-7

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CHILDS ENGINEERING CORPORATION

Waterfront and Structural Engineering

BOX 333, MEDFIELD, MA 02052

JOB 133796.11 UNST

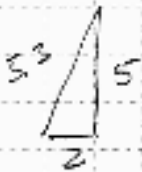
SHEET NO. 7 OF 26

CALCULATED BY CDS DATE 8/98

CHECKED BY PAUL DATE 12/14/98

SCALE _____

BAT PILES WITH 2:5 SLOPE



$$\frac{2}{5.3} = \frac{x}{20} \quad x = 7.55 \text{ T LIFT}$$

$$\frac{5}{5.3} = \frac{x}{20} = 18.86 \text{ T UPLIFT}$$



PRODUCT 100-10 Single Shaver (2001) (7/10/01)

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CHILDS ENGINEERING CORPORATION

Waterfront and Structural Engineering

BOX 333, MEDFIELD, MA 02052

JOB 133796.11 NMS4

SHEET NO 8 OF 26

CALCULATED BY CDS DATE 8/98

CHECKED BY BMK DATE 12/14/98

SCALE _____

FIND DEAD LOAD FOR UPLIFT RESISTANCE

SAY DEPTH OF SOIL = 6' @ 125 #/ft³
= 750 #/SF

18 T = 36000 #

AREA REQ'D / PILE = $\frac{36000}{750} = 48 \text{ SF} = \underline{6.9 \times 6.9}$

SAY 7' x 7' AREA N.G.

CONSIDER PILE UPLIFT -

BASED ON SOIL BORINGS (HISTORIC) CLAY STARTS

APPROX 20' BELOW MLW -

ASSUME CLAY LAYER 30' DEEP

ASSUME APPROX 1000 #/LF UPLIFT CAPACITY (ROT)

∴ UPLIFT TRY PILES IS $30 \times 1000 = \underline{30K}$

NOTE: PILES APPEAR TO BE LOCKED INTO WALE AND CAP SYSTEM BY NOTCHING BASED ON CROSS SECTION DRAWINGS, IN FIELD DETAILS WERE NOT OBSERVED.



PROJECT 204-1 (Single Sheet) 204-1 (Full Sheet)

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CHILDS ENGINEERING CORPORATION

Waterfront and Structural Engineering

BOX 333, MEDFIELD, MA 02052

JOB 133796.11 NNS4

SHEET NO. 9 OF 26

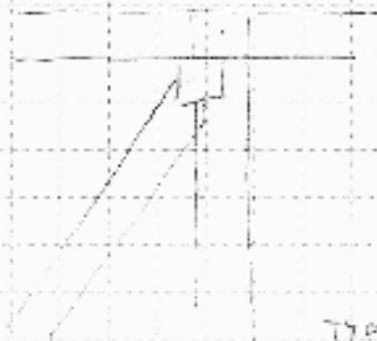
CALCULATED BY CDS DATE 8/98

CHECKED BY DATE DATE 12/17/98

SCALE

CONSIDER THAT DEAD LOAD OVER PILE
ALSO RESISTS UPLIFT.

ASSUME PILES @ 5' O.C. ALONG ROW
BENTS ARE AT 4' O.C.



TYPE PILE ARRANGEMENT

$$\therefore \text{AREA / PILE} = 5' \times 4' = 20 \text{ SF}$$

ASSUME 6' EARTH FILL @ 110 #/ft^3 (CONSERVATIVE)

$$\text{TOTAL WEIGHT OF FILL / PILE} = 20 \text{ SF} \times 6' \times 110 = 13200 \text{ #}$$

$$= \underline{\underline{13.2 \text{ k / PILE}}}$$

$$\text{TOTAL UPLIFT RESISTANCE} = \text{PILE RESISTANCE} + \text{DL}$$

$$= 30 \text{ k} + 13 \text{ k}$$

$$= \underline{\underline{43 \text{ k}}}$$

MAXIMUM UPLIFT REQ'D TO DEVELOPE 20 T
PILE = 19 T OR 38 K

∴ PILES ARE FULLY DEVELOPED FOR LATERAL LOAD

PRODUCED BY: [signature]

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CHILDS ENGINEERING CORPORATION

Waterfront and Structural Engineering

BOX 333, MEDFIELD, MA 02052

JOB 133796.11 NNS4

SHEET NO. 10 OF 26

CALCULATED BY CDS DATE 8/98

ENGINEERED BY PAZ DATE 12/14/98

SCALE _____

- WITH FULLY DEVELOPED ZC T PILE HORIZONTAL
LOAD VARIES FROM 6.32 T TO 7.55 T
DEPENDANT UPON PITCH (SLOPE).
- ASSUME 6.32 T AS MAXIMUM ALLOWABLE LOAD/PILE
IF BENT SPACING IS 4' O.C. THEN LOAD/FT
$$= 6.32T/4 = 1.58T/FT \text{ /PILE}$$



PRODUCT 104 - Single Series - 2011 (Final)

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Waterfront and Structural Engineering

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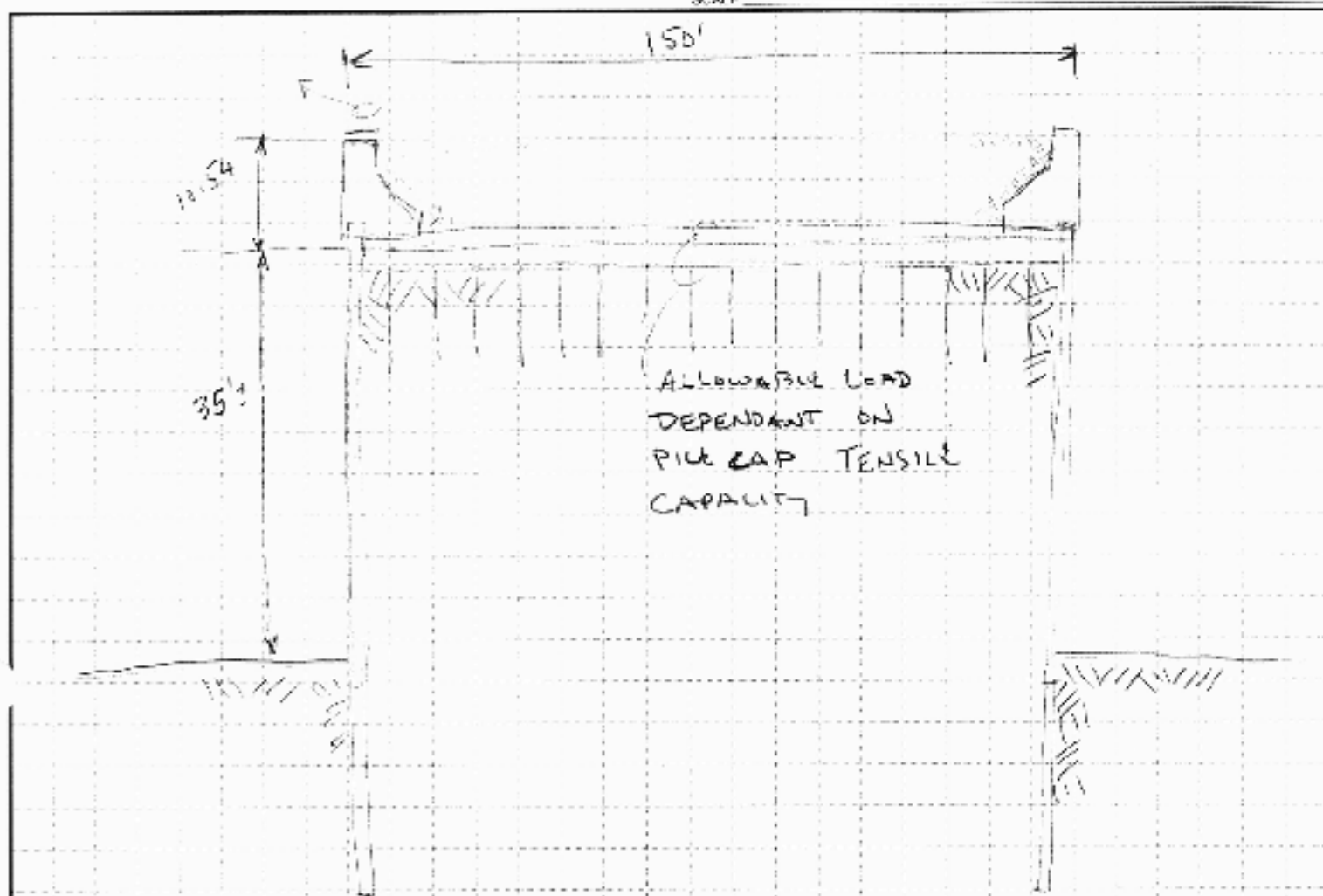
JOB 133796.11 NMS4

SHEET NO. 11 OF 26

CALCULATED BY CDS DATE 8/98

CHECKED BY PAZ DATE 12/14/98

SCALE _____



CONSIDER FREE STANDING
PIER WITHOUT BATTER
PILES.

X-SEC PIER 5

15 PILES / HALF PIER USED AS PASSIVE RESISTANCE TO ACTIVE SOIL PRESSURE.

SAY ALLOWABLE LOAD (LATERAL) ON VERT PILE = 1500 # (CHALIS pg. 23)

TOTAL LOAD / BENT = $15 \times 1500 = 22500 \#$ (using 12 PILES)

ASSUME SOIL PRESSURES CANCEL OUT (PILE CAP ACTS IN TENSION)

NOTE! PASSIVE RESISTANCE OF RETAINED SOIL WILL
PROVIDE SIGNIFICANT LATERAL CAPACITY THAT
IS NOT ACCOUNTED FOR.

PRODUCT OF "DESIGN AND DETAIL" PROGRAM

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CHILDS ENGINEERING CORPORATION

Waterfront and Structural Engineering

BOX 333, MEDFIELD, MA 02052

JOB 133796.11 N434

SHEET NO. 12 OF 26

CALCULATED BY CDS DATE 8/98

CHECKED BY PHZ DATE 12/17/98

SCALE _____

CONSIDER OPEN PIER CONSTRUCTION @ BERTH 3:

BENT SP = 12 O.K.

PILE CAP. (BENT) = 50 T

BATS @ 15°



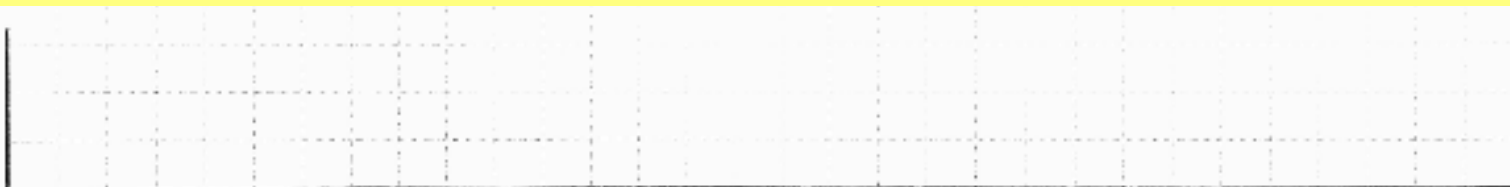
PILE CAPACITY

$$H_{\text{CAP}} = \frac{1}{3.8} = \frac{x}{100} = 26.31 \text{ K}$$

$$V_{\text{CAP}} = \frac{3.7}{3.8} = \frac{x}{100} = 97.4 \text{ K}$$

$$\text{TOTAL LAT CAP} = 26.31 \times 2 \text{ PILES} / 12 \text{ O.C.} = 4.385 \text{ K/CF}$$

ASSUME UPLIFT IS OK



PROD ACT 504 - La Cigale (March 2001) (Shadow)

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CHILDS ENGINEERING CORPORATION

Waterfront and Structural Engineering

BOX 333, MEDFIELD, MA 02052

JOB 153796.11 NMS7

SHEET NO. 13 OF 26

CALCULATED BY COS DATE 8/98

CHECKED BY PHZ DATE 12/19/98

SCALE

CONSIDER CERTAINLY LOAD ON PIERS

CALCULATE BY APPROXIMATE METHODS FOR ALL BELTMS & WHARFS
OF RELIEVING PLATFORM DESIGN



ASSUMPTIONS:

1. LOADS APPLIED HORIZONTALLY INSHORE (P) WILL BE TRANSMITTED THROUGH THE STRUCTURE TO THE SOIL.
2. LOCAL CONDITIONS ARE A SEPARATE ANALYSIS I.E. IMPACT ON SEAWALL
3. SOIL CONDITIONS SIMILAR TO THOSE USED IN CALCS. PRIOR.
4. BY OBSERVATION ACTIVE SOIL PRESSURE NEEDS TO BE OVERCOME TO EFFECT PASSIVE RESISTANCE. PREVIOUSLY CALCULATED

ACTIVE SOIL LOAD ON PILES IS TAKEN
AS THIS LOAD = 4.9 K / LF

PROJECT 2004-1 (Design of Bridge Deck - 1999000)

C-14

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CHILDS ENGINEERING CORPORATION

Waterfront and Structural Engineering

BOX 333, MEDFIELD, MA 02052

JOB 1337 96.11 NNS7

SHEET NO. 14 OF 26

CALCULATED BY CDS DATE 8/98

CHECKED BY PHZ DATE 12/14/98

SCALE

* OMITT ANY DR FROM LL ON DELTA

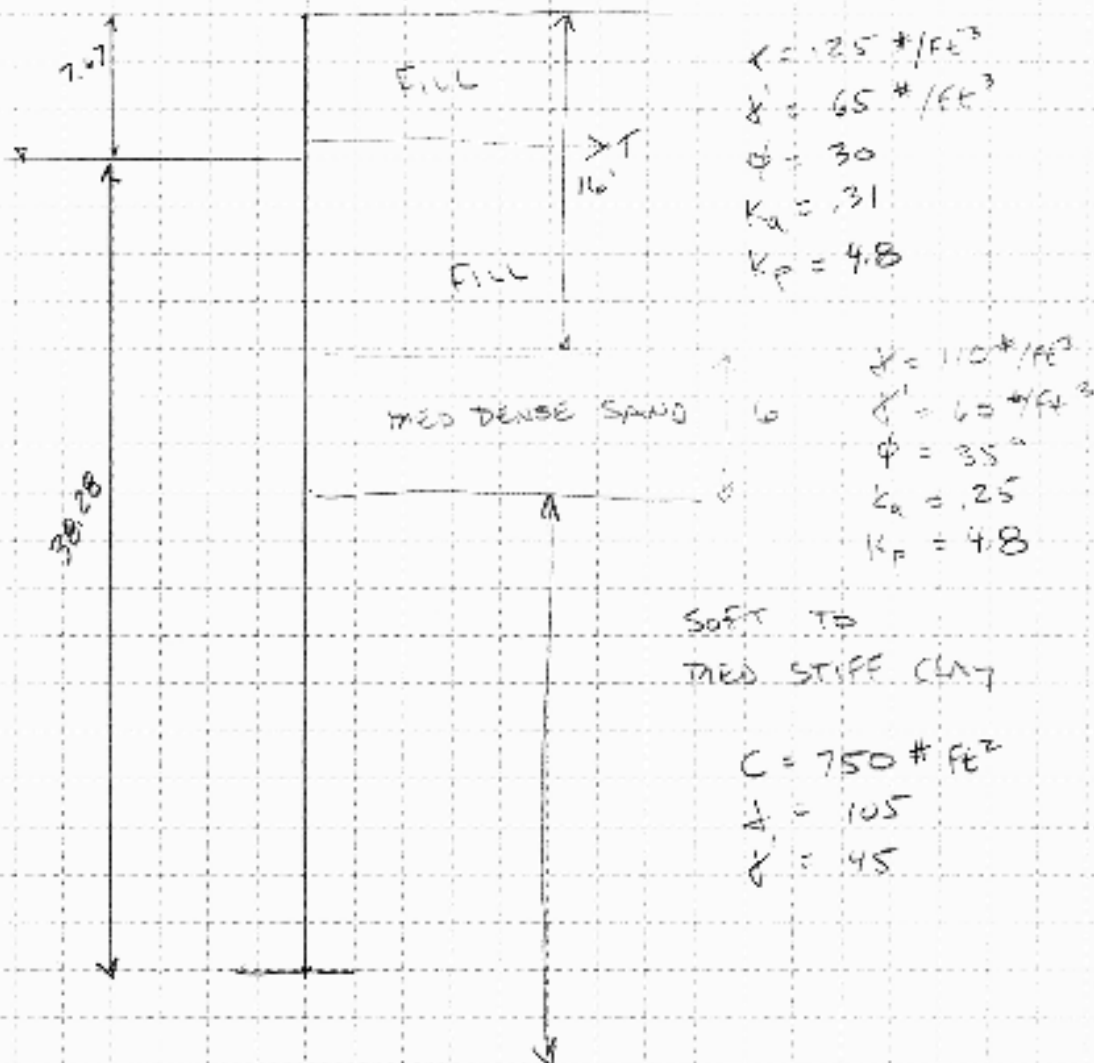




FIGURE 15-1 (Sample Sheet) 15-1 (Sample)

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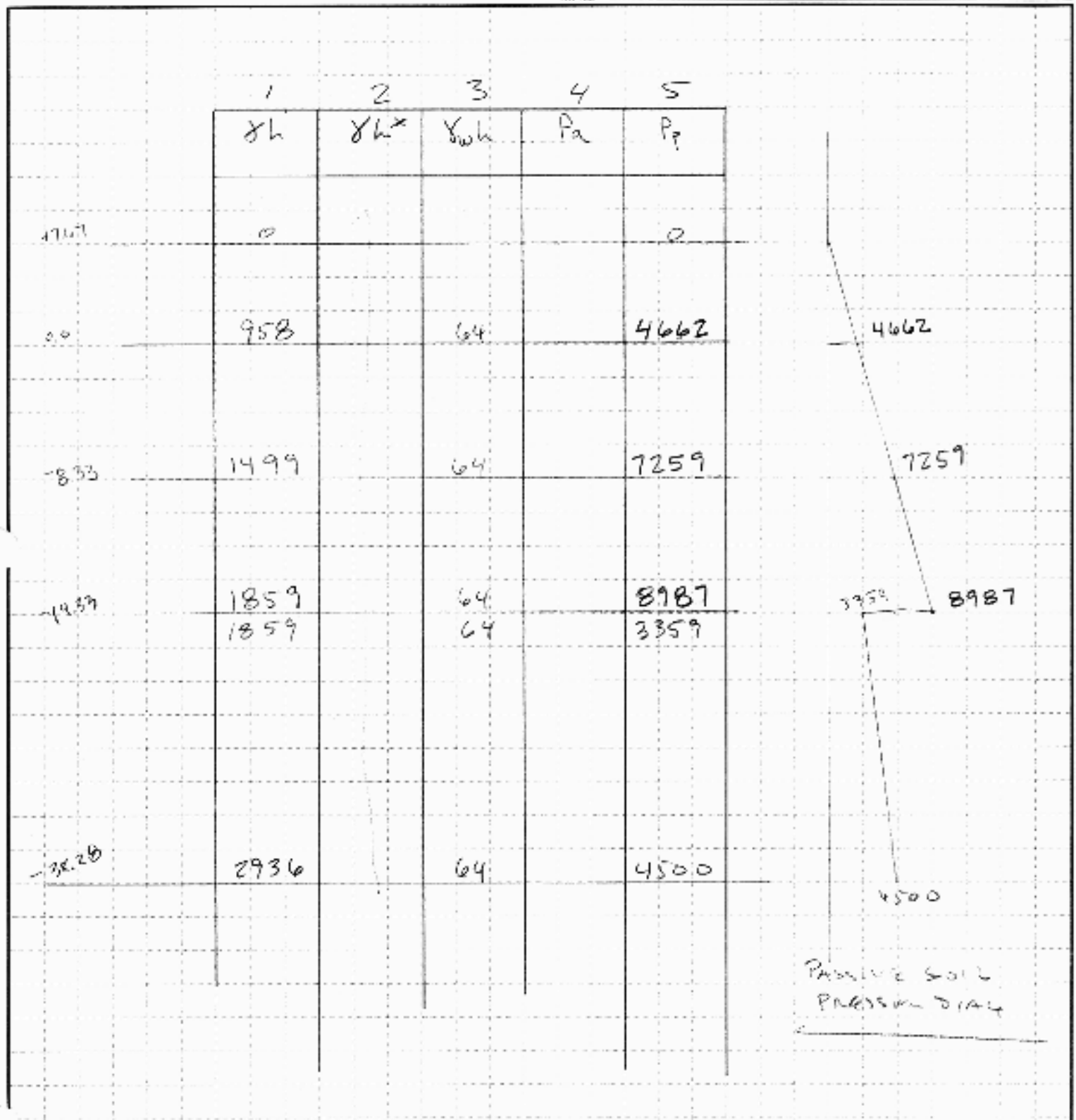
 JOB 133796.11 NMS7

 SHEET NO. 15 OF 26

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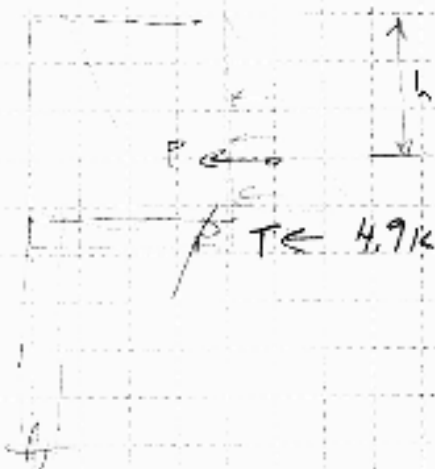
SHEET NO 16 OF 26

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ASSUME: 1. ONLY SEAWALL AREA ACTS TO RESIST BERTHING LOAD ALONG WITH ACTIVE PRESSURE RESULTANT AT 'T'. BERTHING FORCE AT SEAWALL IS RESISTED BY PASSIVE SOIL PRESS.



$$P = \frac{4662 \times 7.67}{2} = 17879 \text{ \#/ft}$$

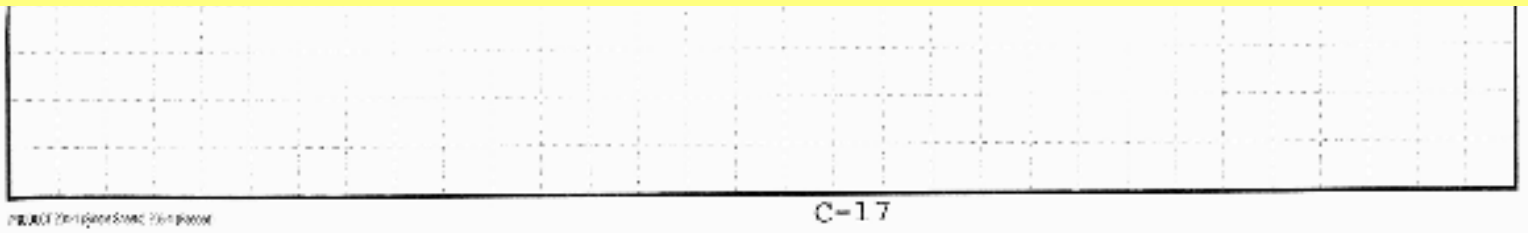
$$h = .66 \times 7.67 = 5' (51 + 2.67)$$

TIE ROD TENSION $T^* = 4.9 \text{ K/ft}$
(@ PILE CAP LEVEL)

$$\text{APPROXIMATE RESISTANCE} = 18.0 + 4.9 = \underline{\underline{23.7 \text{ K/ft}}}$$

(DUE TO SOIL PRESSURE)

NOTE: ADDITIONAL CONSIDERATION OF HULL PRESSURE LOCAL CONDITIONS, FENDER SYS NEED TO BE FACTORED INTO ALLOWABLE BERTHING LOAD.



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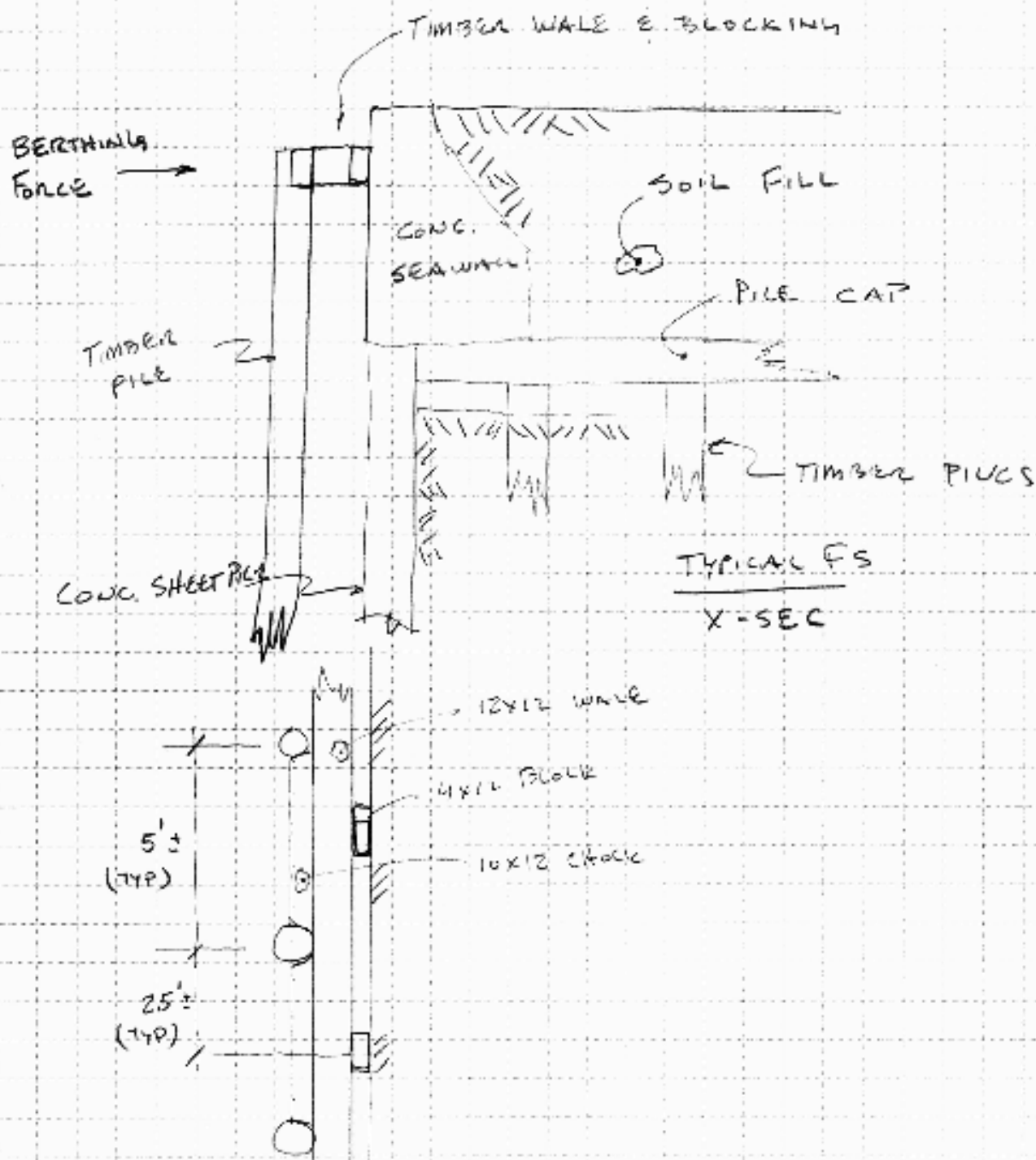
SHEET NO. 17 OF 26

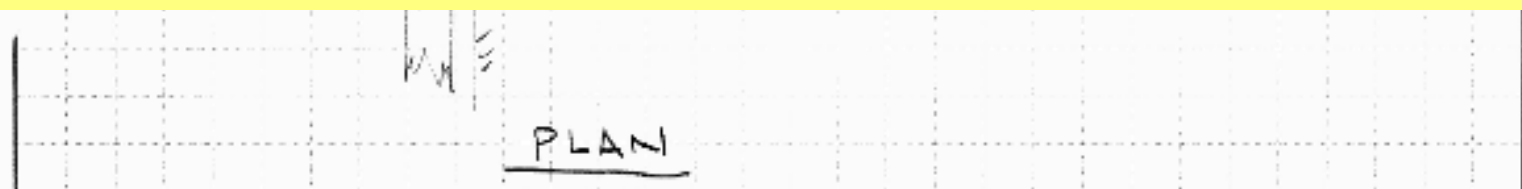
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TIMBER FENDER SYSTEM - CONSIDER MAXIMUM LOAD:





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SHEET NO 18 OF 26

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SCALE

CONSIDER BEARING ON BLOCK

$$A = 12 \times 12 = 144 \text{ in}^2$$

$$F_{CL} = 350 \text{ psi (assumed)}$$

$$P_{MAX} = 350 \text{ psi} \times 144 \text{ in}^2 = 50400 \# = 50.1 \text{ k}$$

CONSIDER SHEAR ON WALE

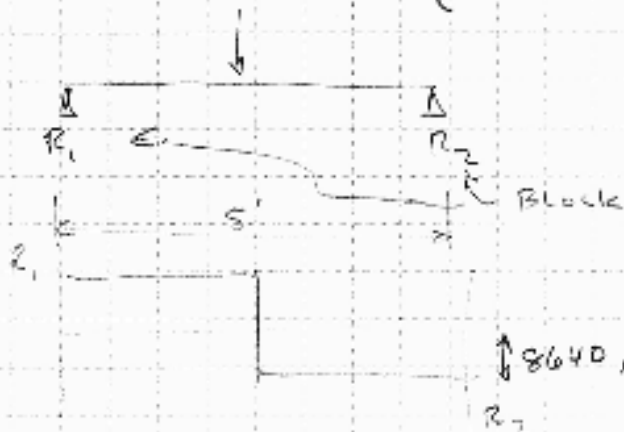
$$F_v = 90 \text{ psi (assumed)}$$

$$F_v = \frac{3}{2} \frac{V}{A}$$

$$A = 144 \text{ in}^2$$

$$V = \frac{2 A F_v}{3} = \frac{2 \times 144 \times 90}{3} = 8640 \#$$

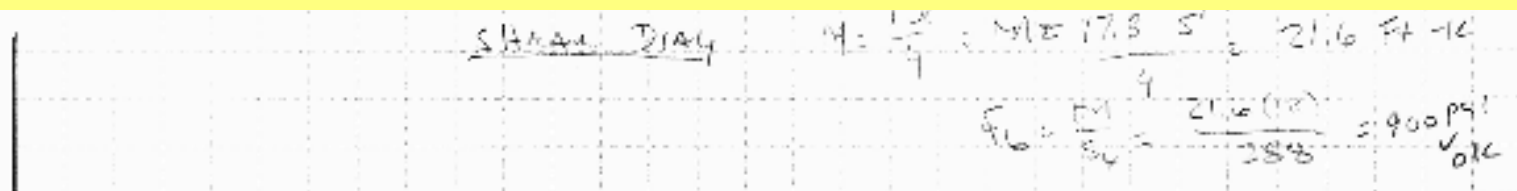
PILR(P) (ASSUME LOADING FROM PILES ONLY)



$$P_{MAX} = 2 (8640)$$

$$P = 17280 \# = 17.3 \text{ k}$$

CHECK BENDING



PRODUCT 1104-1 (Single Sheet) 225-1 (7/20/99)

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SCALE _____

MAXIMUM PILE LOAD ON SPRING TYPE TIMBER
FENDER SYSTEM IS 17.3 K.

RESULTING LINEAR LOAD IS :

$$\frac{17.3}{5' \text{ (SPACING)}} = \underline{\underline{3.46 \text{ K/LF}}}$$

Summary

PIER STRUCTURE ALLOWABLE BERTH LOAD = 23.1 K/LF

FENDER SYSTEM ALLOWABLE BERTH LOAD = 3.46 K/LF

∴ FENDER SYSTEM GOVERNS



FIGURE 1: (a) (b) (c) (d) (e) (f) (g) (h) (i) (j) (k) (l) (m) (n) (o) (p) (q) (r) (s) (t) (u) (v) (w) (x) (y) (z) (aa) (ab) (ac) (ad) (ae) (af) (ag) (ah) (ai) (aj) (ak) (al) (am) (an) (ao) (ap) (aq) (ar) (as) (at) (au) (av) (aw) (ax) (ay) (az) (ba) (bb) (bc) (bd) (be) (bf) (bg) (bh) (bi) (bj) (bk) (bl) (bm) (bn) (bo) (bp) (bq) (br) (bs) (bt) (bu) (bv) (bw) (bx) (by) (bz) (ca) (cb) (cc) (cd) (ce) (cf) (cg) (ch) (ci) (cj) (ck) (cl) (cm) (cn) (co) (cp) (cq) (cr) (cs) (ct) (cu) (cv) (cw) (cx) (cy) (cz) (da) (db) (dc) (dd) (de) (df) (dg) (dh) (di) (dj) (dk) (dl) (dm) (dn) (do) (dp) (dq) (dr) (ds) (dt) (du) (dv) (dw) (dx) (dy) (dz) (ea) (eb) (ec) (ed) (ee) (ef) (eg) (eh) (ei) (ej) (ek) (el) (em) (en) (eo) (ep) (eq) (er) (es) (et) (eu) (ev) (ew) (ex) (ey) (ez) (fa) (fb) (fc) (fd) (fe) (ff) (fg) (fh) (fi) (fj) (fk) (fl) (fm) (fn) (fo) (fp) (fq) (fr) (fs) (ft) (fu) (fv) (fw) (fx) (fy) (fz) (ga) (gb) (gc) (gd) (ge) (gf) (gg) (gh) (gi) (gj) (gk) (gl) (gm) (gn) (go) (gp) (gq) (gr) (gs) (gt) (gu) (gv) (gw) (gx) (gy) (gz) (ha) (hb) (hc) (hd) (he) (hf) (hg) (hh) (hi) (hj) (hk) (hl) (hm) (hn) (ho) (hp) (hq) (hr) (hs) (ht) (hu) (hv) (hw) (hx) (hy) (hz) (ia) (ib) (ic) (id) (ie) (if) (ig) (ih) (ii) (ij) (ik) (il) (im) (in) (io) (ip) (iq) (ir) (is) (it) (iu) (iv) (iw) (ix) (iy) (iz) (ja) (jb) (jc) (jd) (je) (jf) (jg) (jh) (ji) (jj) (jk) (jl) (jm) (jn) (jo) (jp) (jq) (jr) (js) (jt) (ju) (jv) (jw) (jx) (jy) (jz) (ka) (kb) (kc) (kd) (ke) (kf) (kg) (kh) (ki) (kj) (kk) (kl) (km) (kn) (ko) (kp) (kq) (kr) (ks) (kt) (ku) (kv) (kw) (kx) (ky) (kz) (la) (lb) (lc) (ld) (le) (lf) (lg) (lh) (li) (lj) (lk) (ll) (lm) (ln) (lo) (lp) (lq) (lr) (ls) (lt) (lu) (lv) (lw) (lx) (ly) (lz) (ma) (mb) (mc) (md) (me) (mf) (mg) (mh) (mi) (mj) (mk) (ml) (mm) (mn) (mo) (mp) (mq) (mr) (ms) (mt) (mu) (mv) (mw) (mx) (my) (mz) (na) (nb) (nc) (nd) (ne) (nf) (ng) (nh) (ni) (nj) (nk) (nl) (nm) (nn) (no) (np) (nq) (nr) (ns) (nt) (nu) (nv) (nw) (nx) (ny) (nz) (oa) (ob) (oc) (od) (oe) (of) (og) (oh) (oi) (oj) (ok) (ol) (om) (on) (oo) (op) (oq) (or) (os) (ot) (ou) (ov) (ow) (ox) (oy) (oz) (pa) (pb) (pc) (pd) (pe) (pf) (pg) (ph) (pi) (pj) (pk) (pl) (pm) (pn) (po) (pp) (pq) (pr) (ps) (pt) (pu) (pv) (pw) (px) (py) (pz) (qa) (qb) (qc) (qd) (qe) (qf) (qg) (qh) (qi) (qj) (qk) (ql) (qm) (qn) (qo) (qp) (qq) (qr) (qs) (qt) (qu) (qv) (qw) (qx) (qy) (qz) (ra) (rb) (rc) (rd) (re) (rf) (rg) (rh) (ri) (rj) (rk) (rl) (rm) (rn) (ro) (rp) (rq) (rr) (rs) (rt) (ru) (rv) (rw) (rx) (ry) (rz) (sa) (sb) (sc) (sd) (se) (sf) (sg) (sh) (si) (sj) (sk) (sl) (sm) (sn) (so) (sp) (sq) (sr) (ss) (st) (su) (sv) (sw) (sx) (sy) (sz) (ta) (tb) (tc) (td) (te) (tf) (tg) (th) (ti) (tj) (tk) (tl) (tm) (tn) (to) (tp) (tq) (tr) (ts) (tt) (tu) (tv) (tw) (tx) (ty) (tz) (ua) (ub) (uc) (ud) (ue) (uf) (ug) (uh) (ui) (uj) (uk) (ul) (um) (un) (uo) (up) (uq) (ur) (us) (ut) (uu) (uv) (uw) (ux) (uy) (uz) (va) (vb) (vc) (vd) (ve) (vf) (vg) (vh) (vi) (vj) (vk) (vl) (vm) (vn) (vo) (vp) (vq) (vr) (vs) (vt) (vu) (vv) (vw) (vx) (vy) (vz) (wa) (wb) (wc) (wd) (we) (wf) (wg) (wh) (wi) (wj) (wk) (wl) (wm) (wn) (wo) (wp) (wq) (wr) (ws) (wt) (wu) (wv) (ww) (wx) (wy) (wz) (xa) (xb) (xc) (xd) (xe) (xf) (xg) (xh) (xi) (xj) (xk) (xl) (xm) (xn) (xo) (xp) (xq) (xr) (xs) (xt) (xu) (xv) (xw) (xx) (xy) (xz) (ya) (yb) (yc) (yd) (ye) (yf) (yg) (yh) (yi) (yj) (yk) (yl) (ym) (yn) (yo) (yp) (yq) (yr) (ys) (yt) (yu) (yv) (yw) (yx) (yy) (yz) (za) (zb) (zc) (zd) (ze) (zf) (zg) (zh) (zi) (zj) (zk) (zl) (zm) (zn) (zo) (zp) (zq) (zr) (zs) (zt) (zu) (zv) (zw) (zx) (zy) (zz)

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JOB 133796.11 NINSY

SHEET NO. 20 OF 26

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SCALE

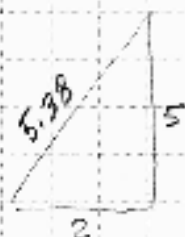
CONSIDER BATTER PILE RESISTANCE FOR THE
FOLLOWING BERTHS:

BERTHS 9 + 10

ASSUMPTIONS:

- 20T DRIVEN CAPACITY PILES
- 10T UPLIFT CAPACITY FOR PILES
- BATTER SLOPE 2:5
- BERTH 9 - 8' BENT SP
- 1 BATTER & 1 VERTICAL PILE
- BERTH 10 - 8' BENT SP
- 2 BATTER & 3 VERTICAL PILES
- SHEET PILE BULKHEADS IN SHORE
RESIST ACTIVE SOIL PRESSURE INDEPENDENTLY

- BERTH 9



By SIMILAR TRIANGLES:

CAPACITY IS LIMITED BY UPLIFT

$$\frac{2}{5} = \frac{x}{10T(\text{PILE}) + 3.75T(\text{DL})}$$

$$x = 5.5T$$

$$\text{LOAD / FT OF BERTH} = \frac{x}{8'} = \frac{5.5T}{8'} = 1.375T$$



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SCALE _____

- BERTH 10

By SIMILAR TRIANGLES:

$$\frac{2}{5} = \frac{x}{(13.75)A} \quad x = 8.25T$$

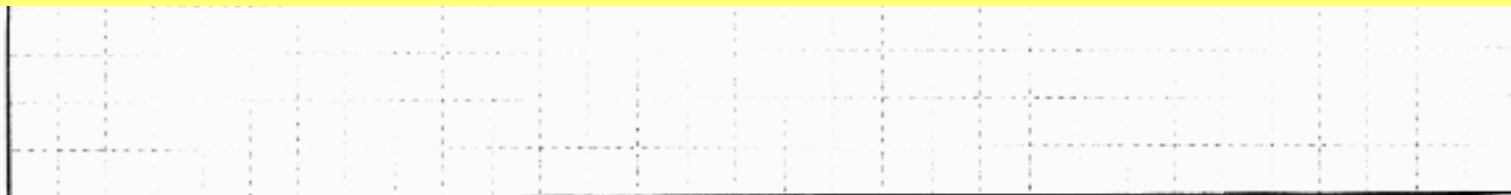
$$A = \frac{3}{2} = 1.5 \text{ VERTICAL PILES/BATTER}$$

CHECK BATTER PILE CAPACITY:

$$\frac{2}{5.38} = \frac{x}{20T} \quad x = 7.43$$

∴ BATTER PILES ARE FULLY DEVELOPED

$$\text{LOAD / FT OF BERTH} = \frac{7.43T(2)}{4'} = 3.71 \text{ K/LF}$$



PROD CT 2004 Single Sheet (2004) (2004)

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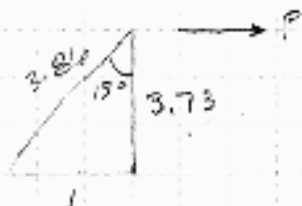
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 SCALE

- BERTHS 1B $\frac{1}{1.9}$

ASSUMPTIONS

- PILE DRIVEN CAPACITY = 60T
- BENT SP 11.75'
- ONE BATTER/VERTICAL PILE PAIR WORK TOGETHER PER BENT
- 15° SLOPE ON BATTER PILES
- UPLIFT = 50% OF DRIVEN CAPACITY



TO DEVELOP BATTER PILE:

$$\frac{60}{3.86} = \frac{x}{1} \quad x = 15.54T$$


TO DEVELOP VERTICAL PILE

$$\frac{30}{3.73} = \frac{x}{1} \quad x = 8.04T$$

$$= 16.08K$$

$$\text{RESULTANT MOORING LOAD} = \frac{16.08}{11.75}$$

$$= 1.37 K/LF$$



GROUP 264 | Single Row | 20 | 10

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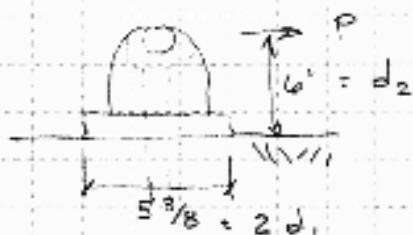
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SHEET NO. 23 OF 26

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SCALE

24" CLEAT2 BOLTS 1" ϕ ASSUME A 307FIND MAX SHEAR, V_u (CONSIDER BOLTS ONLY)

$$V_{\text{bolt}} = 7.9 \text{ K / BOLT SINGLE SHEAR FROM TABLE AISC 4-5}$$

$$V_{\text{CLEAT}} = (2)(7.9) = \underline{15.8 \text{ K}}$$

FIND MAX TENSION, T

$$T_{\text{BOLT}} = 15.7 \text{ K / BOLT}$$

ASSUME ROTATION @ EDGE OF BASE

$$\text{MOMENT ARM}(d) = 5.375'' / 2 = 2.6875''$$

$$M = T d_1 = (2)(15.7)(2.6875) = 84.4 \text{ K-IN}$$

$$P = \frac{M}{d_2} = \frac{84.4}{5.875} = 14.06 \text{ K}$$

d_2 b
∴ CLEAT CAPACITY IS 14K OR 7T WITH PROPER BOLT ANCHORAGE

4008 (3-20-91) Single Story, 12th Edition

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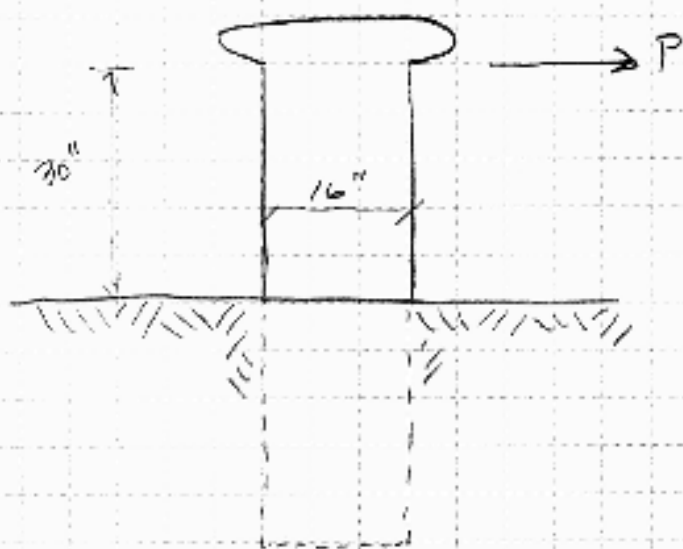
SHEET NO. 24 OF 26

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SCALE _____

SINGLE T.B.T



ASSUME: $\frac{3}{4}$ " WALL

• FIXED @ DECK

• CAST STEEL $F_y = 60 \text{ ksi}$

BENDING :

$$S_x = 130.9 \text{ in}^3$$

$$F_y = .6 \text{ } 60 \text{ ksi} = 36 \text{ ksi}$$

$$M = F_y S_x = 130.9 \times 36 \text{ ksi} = 4712 \text{ in-k} = 392 \text{ ft-k}$$

$$P = 4712 / 30 = \underline{157 \text{ k}} = \underline{78.5 \text{ T}}$$

SHEAR :

• ASSUME STEEL TAKES FULL LOAD

$$A = 35.9 \text{ in}^2$$

$$F_v = 14.4 \text{ ksi} \quad \text{SINGLE SHEAR}$$

$$V = F_v A = 35.9_{\text{ksi}} \times 14.4_{\text{ksi}} = \underline{516.96 \text{ k}}$$

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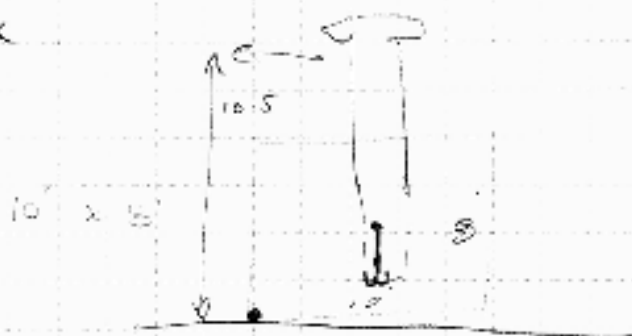
SHEET NO. 25 of 26

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SCALE

CONC BLOCK



Assume 10' wide

$$W = 120,000 \#$$

$$= 60 \text{ T}$$

$$\text{OVERTURNING MOMENT} = 5' \times 120 \text{ K} = 600 \text{ Ft-K}$$

$$P_{\text{MAX}} = \frac{600 \text{ ft-k}}{10.5} = \underline{57 \text{ K}}$$

IF PILES ARE CONNECTED

SAY 3 PILES @ 2 BENTS = 6 PILES ACTING

SAY 10 T / PILE = 60 TON (TENSILE CAP)

MOMENT DUE TO PILES:

$$5' \times 120 \text{ K} = 600 \text{ Ft-K}$$

$$\text{TOTAL RESISTING M} = 600 + 600 = 1200 \text{ Ft-K}$$

$$P_{\text{MAX}} = \frac{1200}{10.5} = 114 \text{ K}$$

\therefore SAY MAX P = 55 TONS

NOTE: IN SOME CASES ANCILLARY MAY BE GREATER.

FIGURE 13-64 ■ Sample Budget, 2007-14 (continued)

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JOB NO. 7 MECHANICAL HOWE COND. REPORT

SHEET NO. 1 OF 2

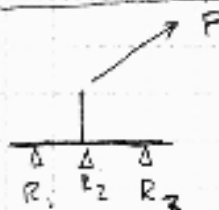
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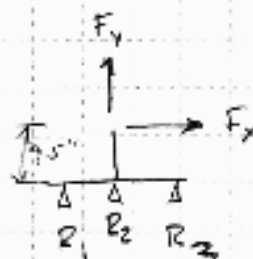
SCALE

26" CLEAT W/OVAL BASE

CASE



=



$$M = 9.5(F_y)$$

ASSUME ONLY ONE FASTENER IS ACTING ON BASE PLATE



$$\therefore R_1 \cdot 9.5 = M = F_y \cdot 9.5$$

$$R_1 = F_y$$

R_1 = ALLOWABLE BOLT TENSION

FOR A 307 BOLT $R_1 = 24.5 \text{ K}$ ← 1 1/4"

CONSIDER F_y :

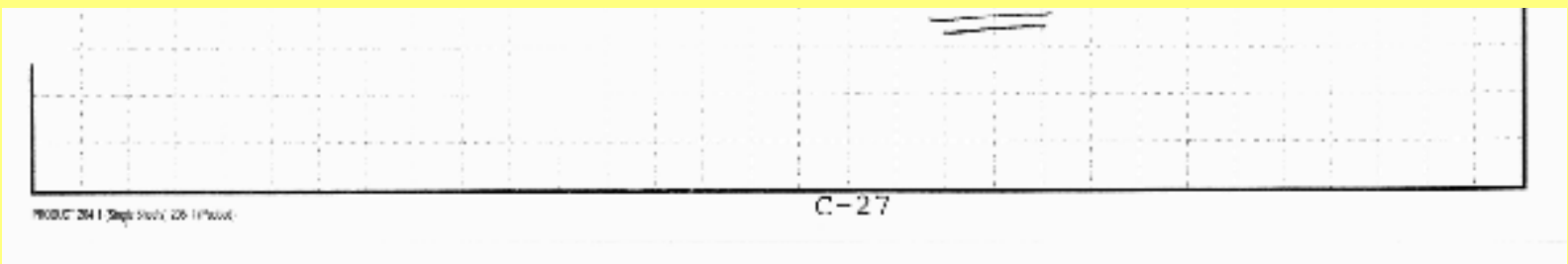
ASSUME F_y IS CARRIED BY BOLTS @ R_2

$$F_{y \text{ MAX}} = 24.5 \text{ K} \times 2^{\text{BOLTS}} = 49 \text{ K}$$

$$\therefore \text{IF } R_1 = 24.5 \text{ \& } F_x = 24.5$$

$$F_y = 24.5$$

$$\text{AND } P = \sqrt{24.5^2 + 24.5^2} = 34.6 \text{ K}$$



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SHEET NO. 2 OF 2

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SCALE _____

CHECK SHEET

$$V_{MAX} = 4 \times 12.3 = 49.2 \text{ K}$$

$$\text{MAX LOAD Horiz.} = 24.5 \text{ K}$$

$$\text{MAX LOAD @ } 45^\circ = 34.6$$

RATE 26" CLEAT @ 12 TONS (Horiz)

16 TONS (45°)



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JOB NMS4 MODIFY FITTINGS

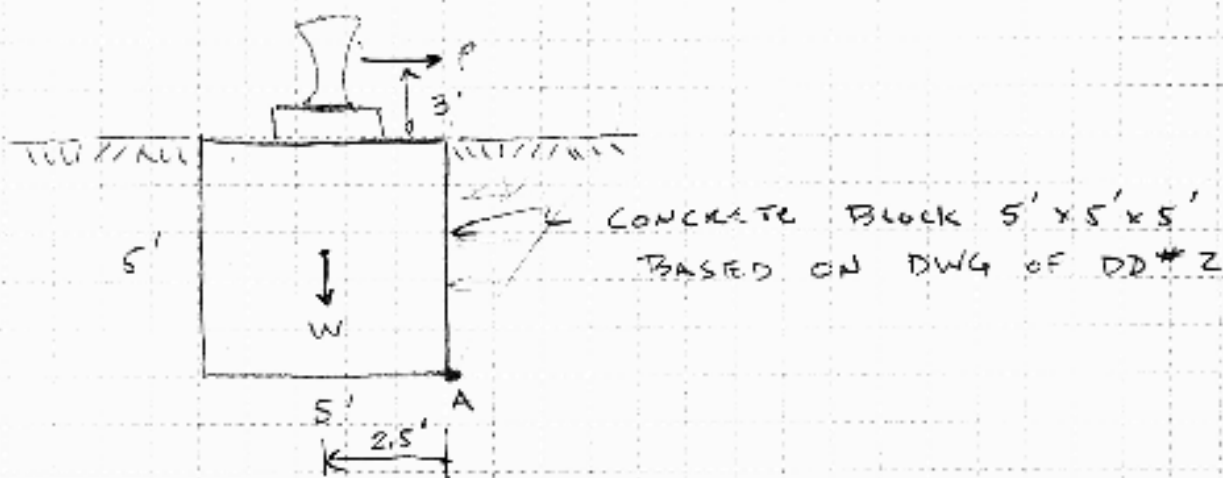
SHEET NO. 1 OF 2

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CHECKED BY RSG DATE 12/98

SCALE

HAND CAPSTAN



FIND TIPPING MOMENT OF CONCRETE BLOCK @ POINT A

$$W = 5' \times 5' \times 5' \times 150 = 18750 \text{ #}$$

$$M = 18.75 \times 2.5 = 46.875 \text{ Ft-k}$$

$$P = \frac{46.875}{8'} = 5.86 \text{ k}$$



Figure 28.1 (Sample Blank) (C-29)

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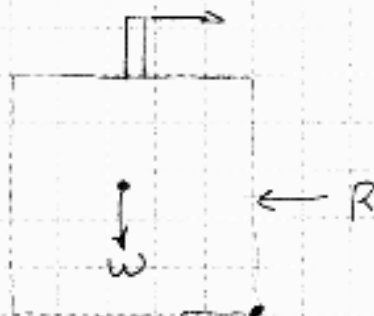
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BOX 333, MEDFIELD, MA 02052

JOB 133796.11 NH07
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 SCALE _____



From TABLE 13.5 SAFE RESISTANCE OF ISOLATED
 BLOCKS... A. 437 FOUNDATION ENGINEERING HANDBOOK
 BY WINTERKORN AND FANG.

ASSUME SOIL IS:

- COHESIONLESS
- $\phi = 30^\circ$
- TOP OF BLOCK IS AT GRADE ($S=0$)

For a 5' x 5' block $R = 24.6 \text{ k}$

$$M_R = 24.6 \times 2.5 = 61.5 \text{ ft-k}$$

$$\text{RESISTANCE TO LINE PULL} = \frac{61.5 \text{ ft-k}}{8'} = \underline{7.69 \text{ k}}$$

$$\text{TOTAL RESISTANCE} = 7.69 + 5.86 = \underline{\underline{13.55 \text{ k}}}$$



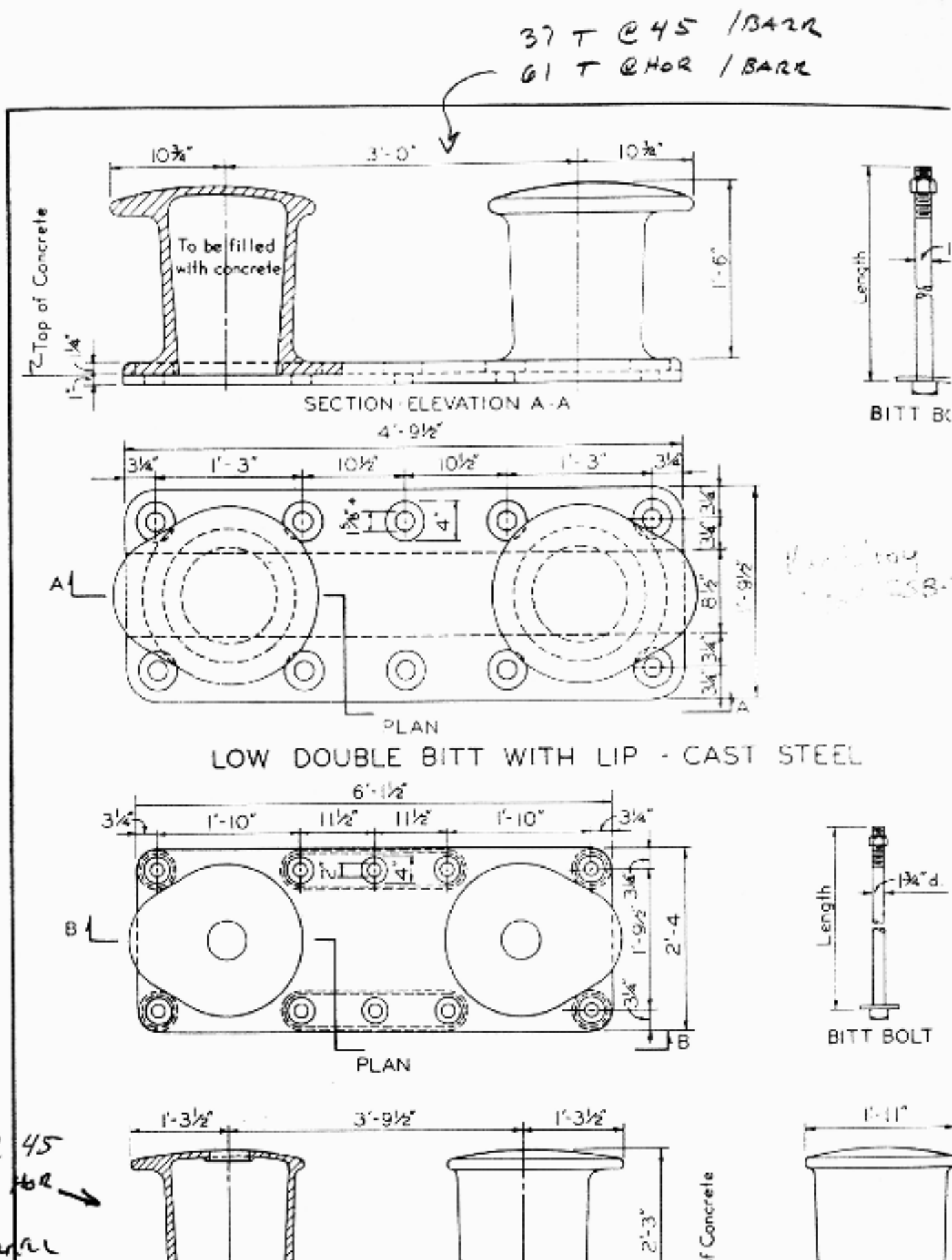
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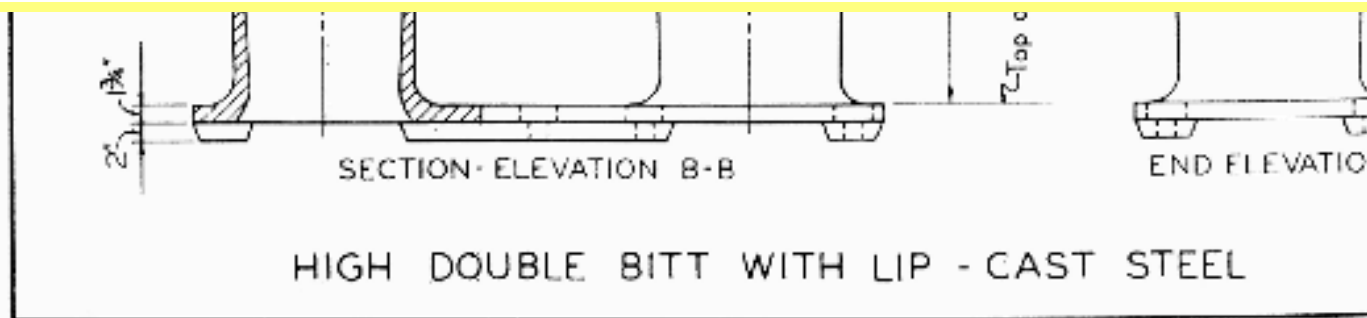
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DM 25

FIGURE 2-32

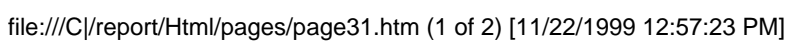
Bitts

25-2-46

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ELEVATION SECTION

CORNER MOORING POST
Cast Steel

FIGURE 2-28
Bollards

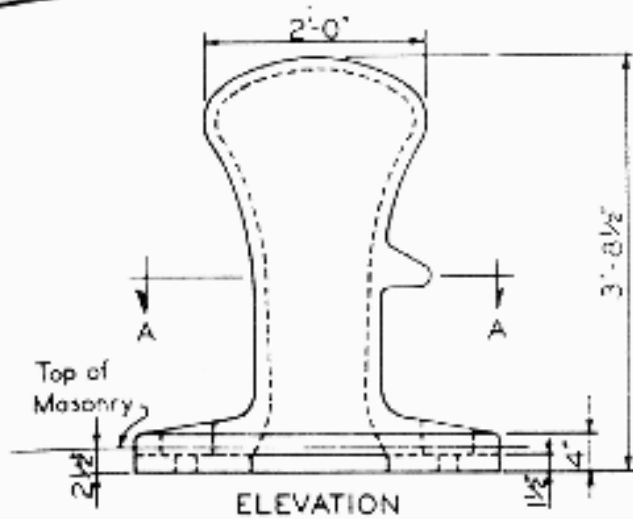
25-2-42

C-32

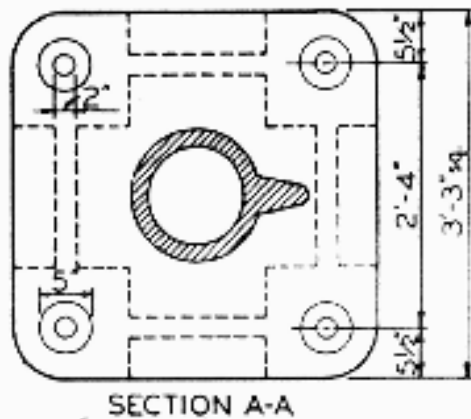
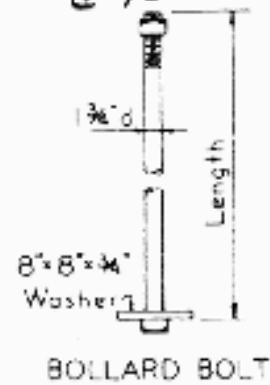
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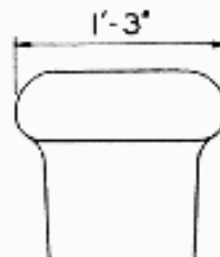
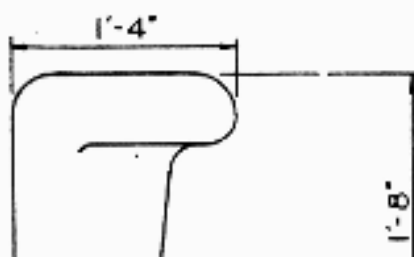
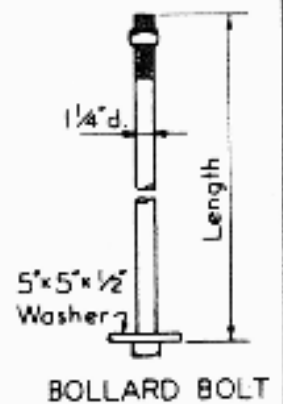
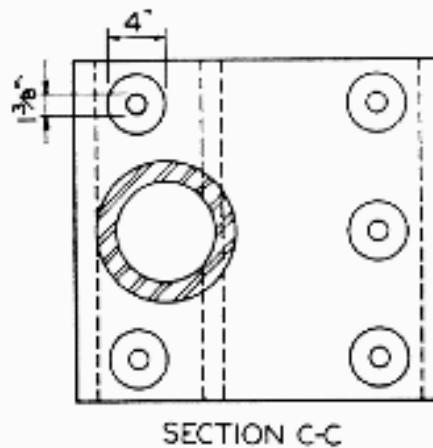
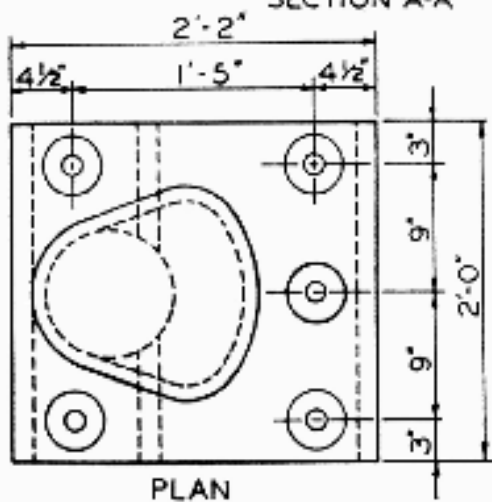
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50 Ton Bollard @ Horiz
33 Ton @ 45°



BOLLARD WITH HORN
Cast Steel



BOLLARD

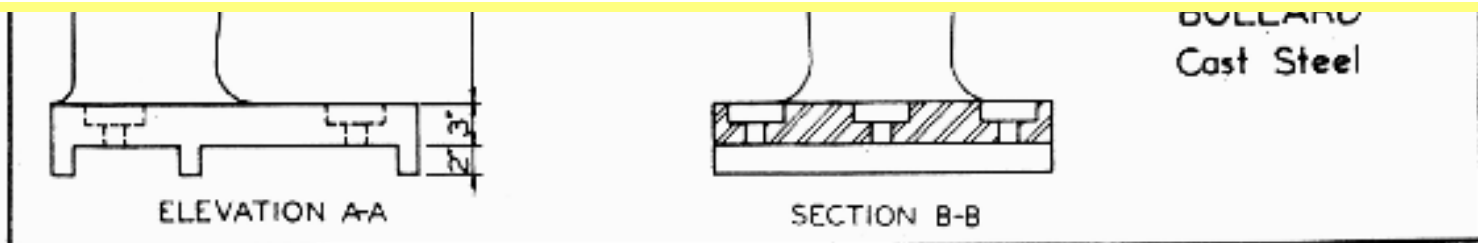


FIGURE 2-29
Bollards
25-2-43

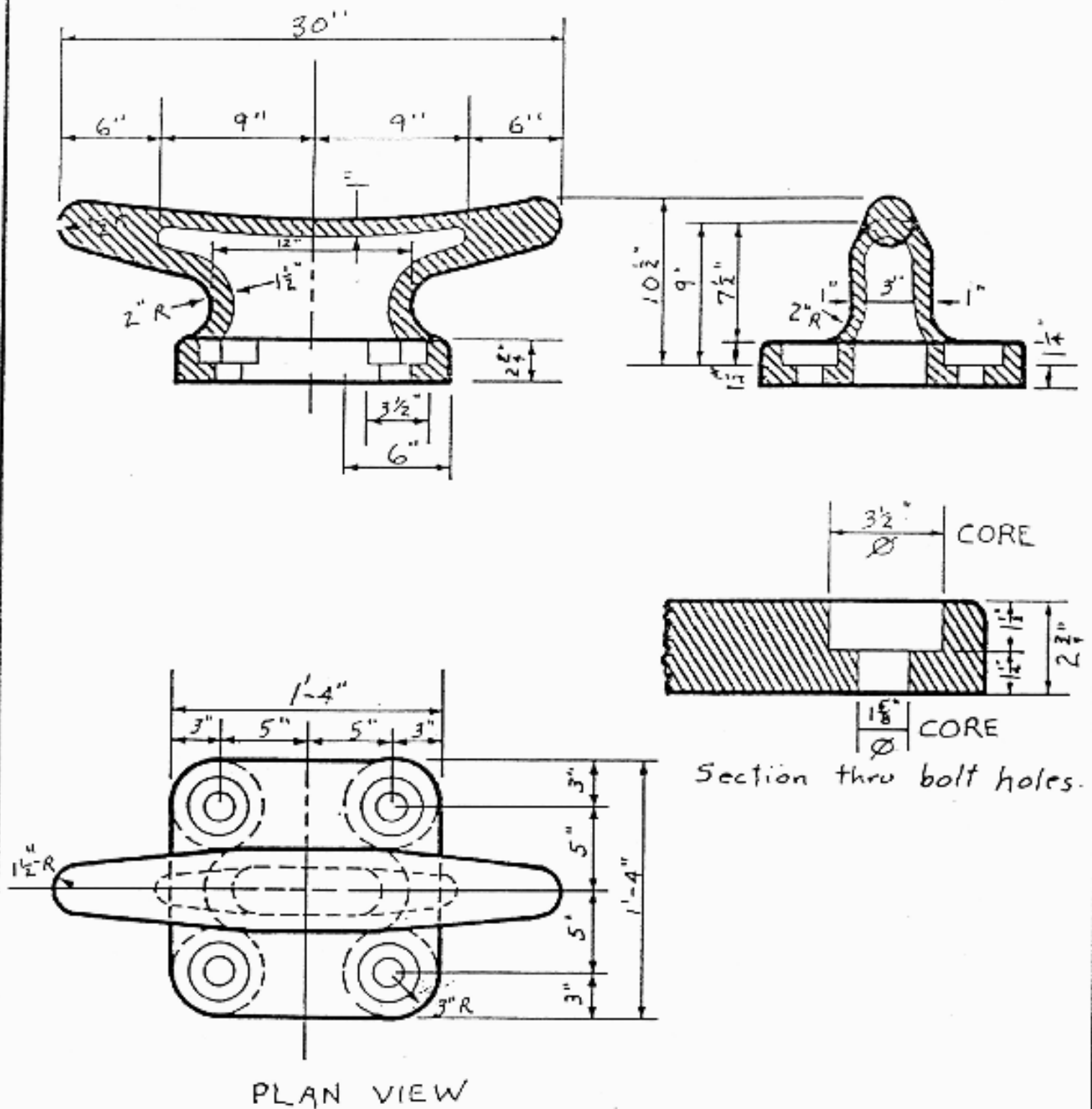
DMA 25

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CAPACITY 10 TONS



CLEAT—CAST STEEL



BLUE WATER MARINE

DIVISION

INTERNATIONAL MARINE & SPECIALTY SUPPLY INC.

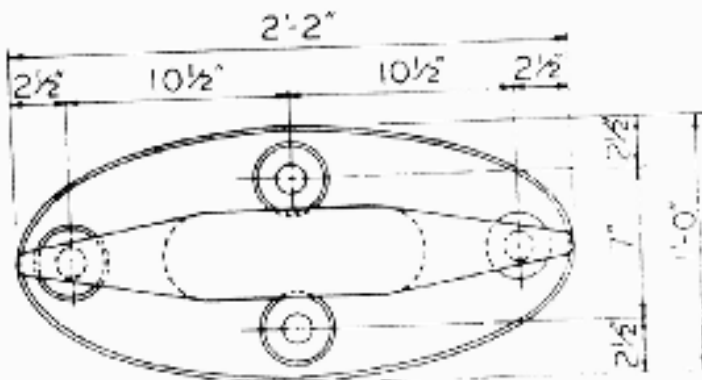
P.O. BOX 266599 • HOUSTON, TEXAS 77207-6599 USA
TELEPHONE: (713) 645-0192 • TELEX: 775183 • FAX: (713) 643 2292

PART NO. C10-1616

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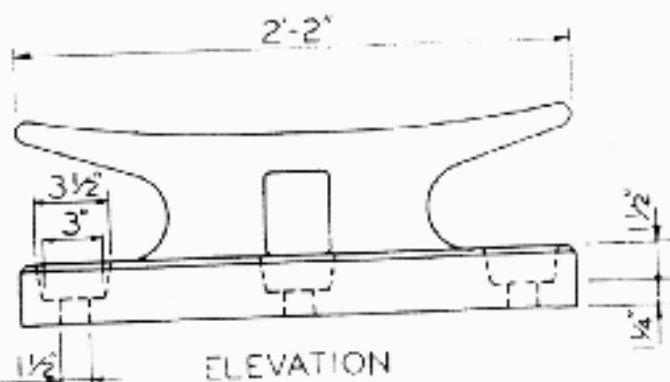
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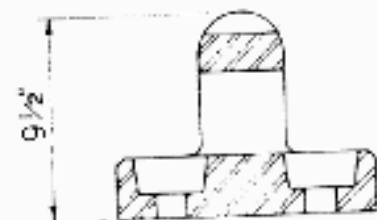


PLAN

— 12 TON HORIZ

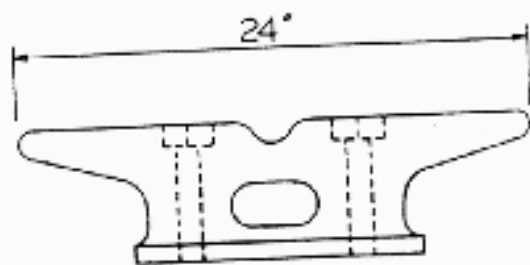


ELEVATION

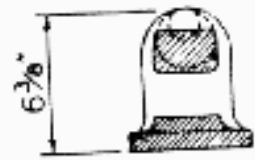


SECTION

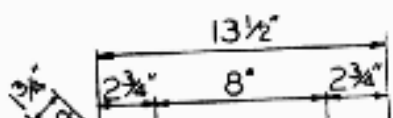
26" OVAL BASE CAST STEEL CLEAT



ELEVATION



END VIEW



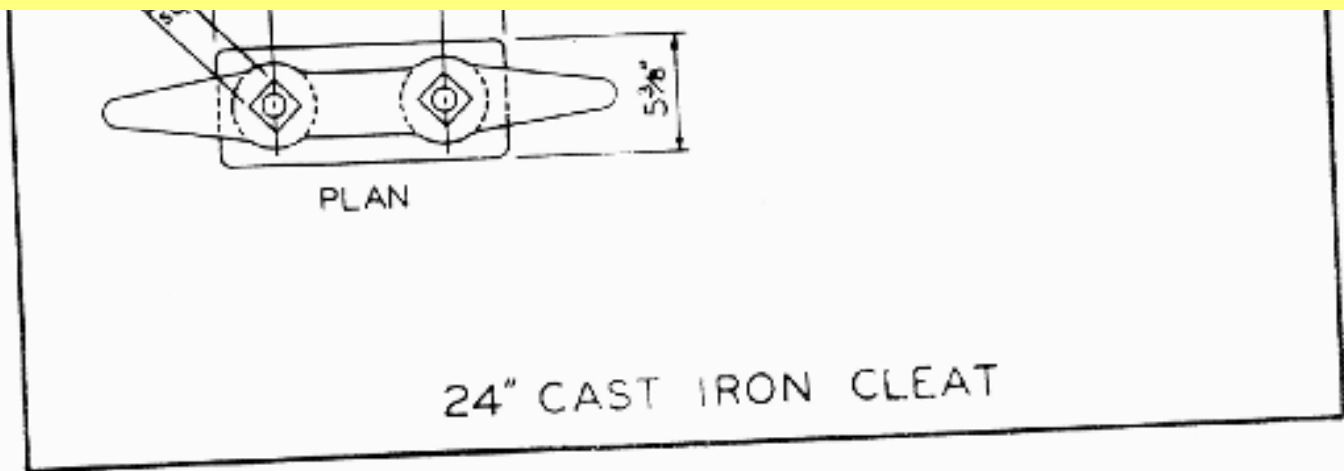


FIGURE 2-37
Smaller Cleats

DM 25

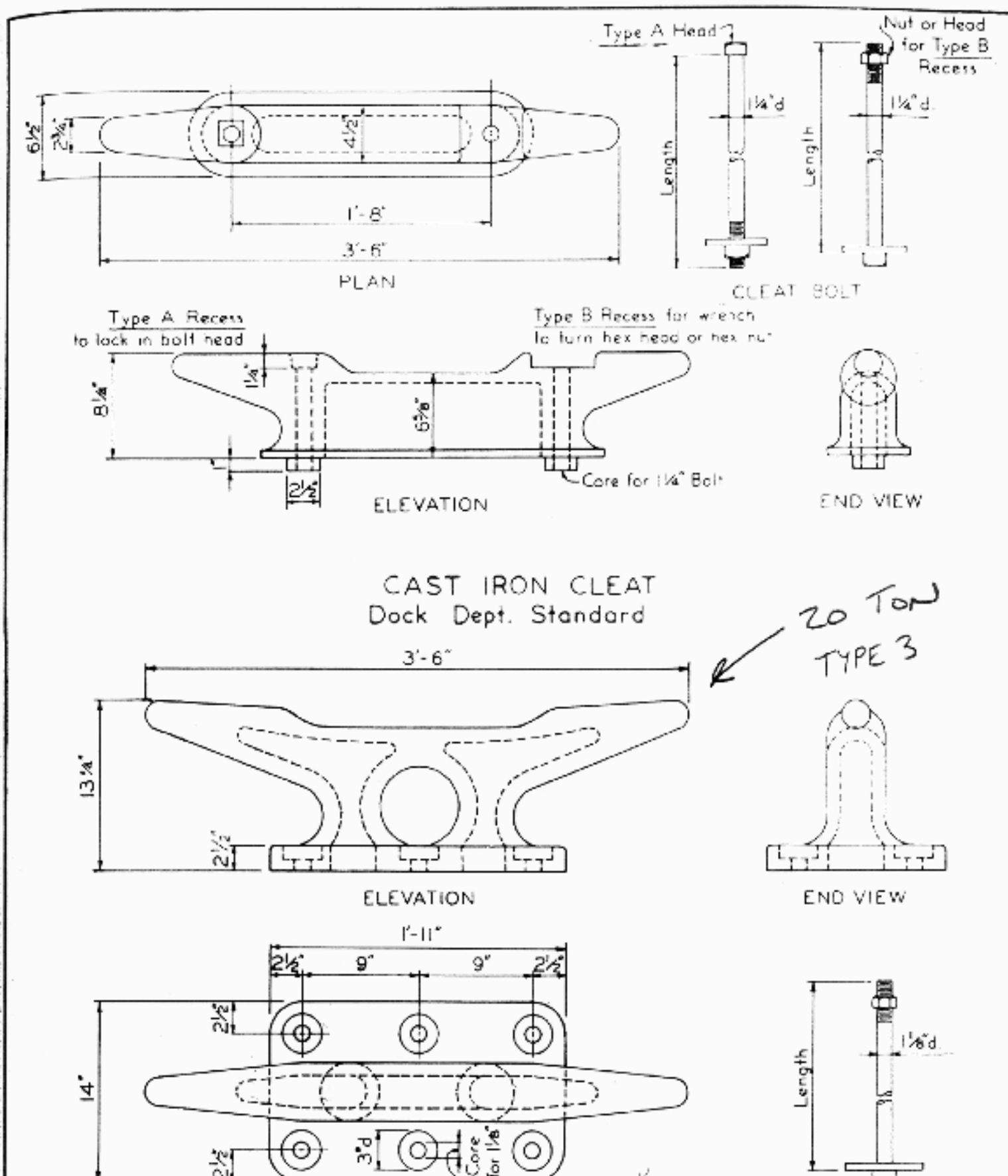
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PLAN

CLEAT BOLT

42" CLEAT - CAST STEEL

FIGURE 2-35
Cleats

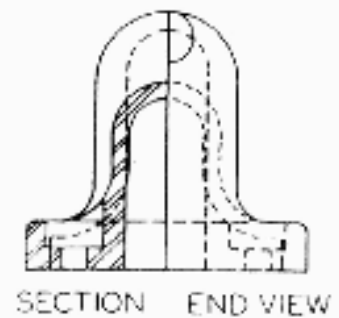
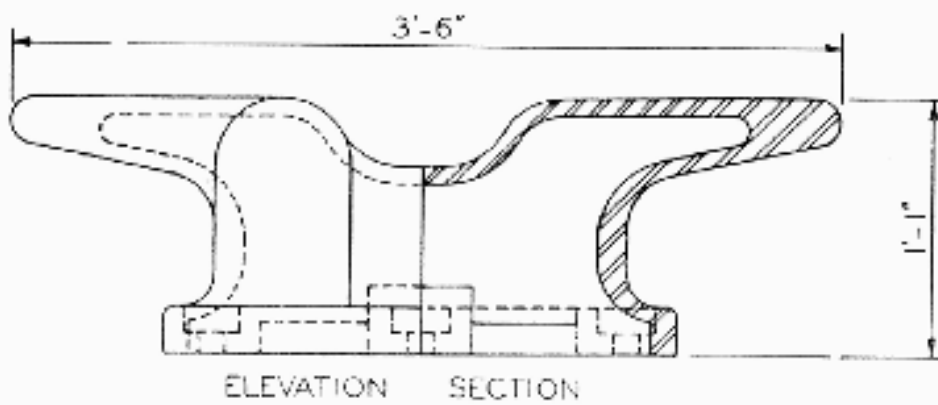
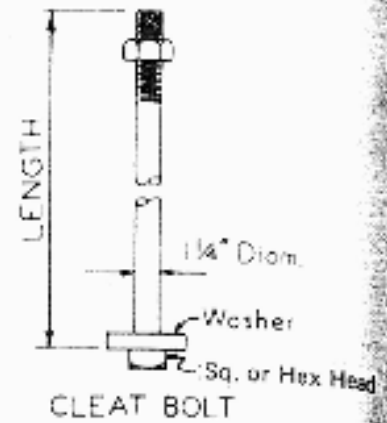
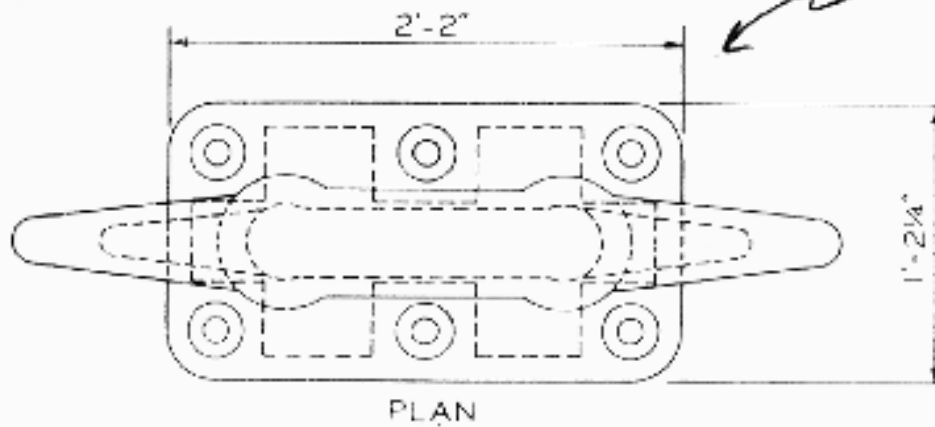
C-36 25-2-49

DM 25

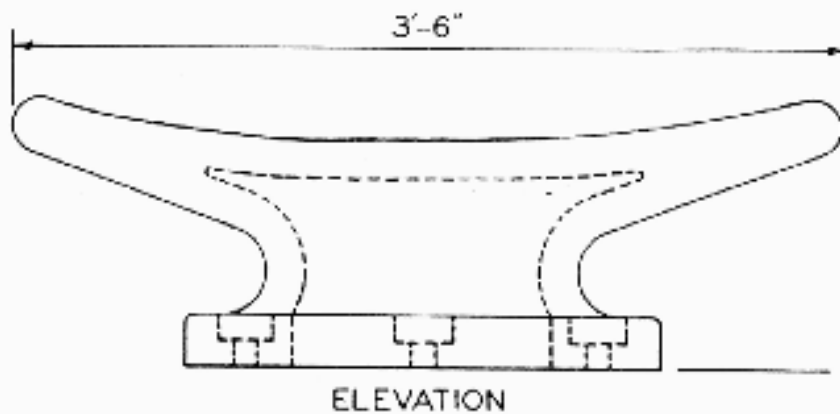
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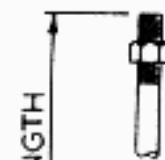
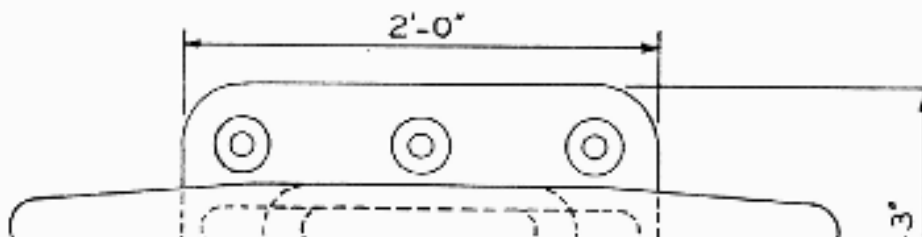
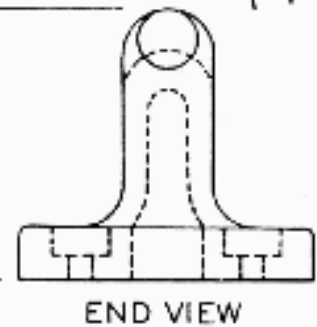
20 Ton TYPE 1

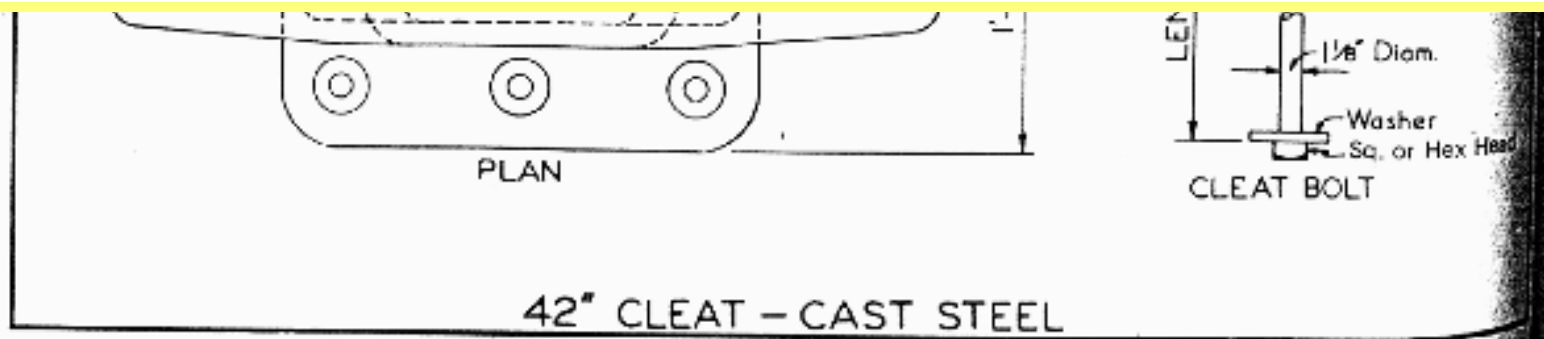


42" CLEAT - CAST STEEL



20 Ton TYPE 2





DM 25

FIGURE 2-34

Cleats

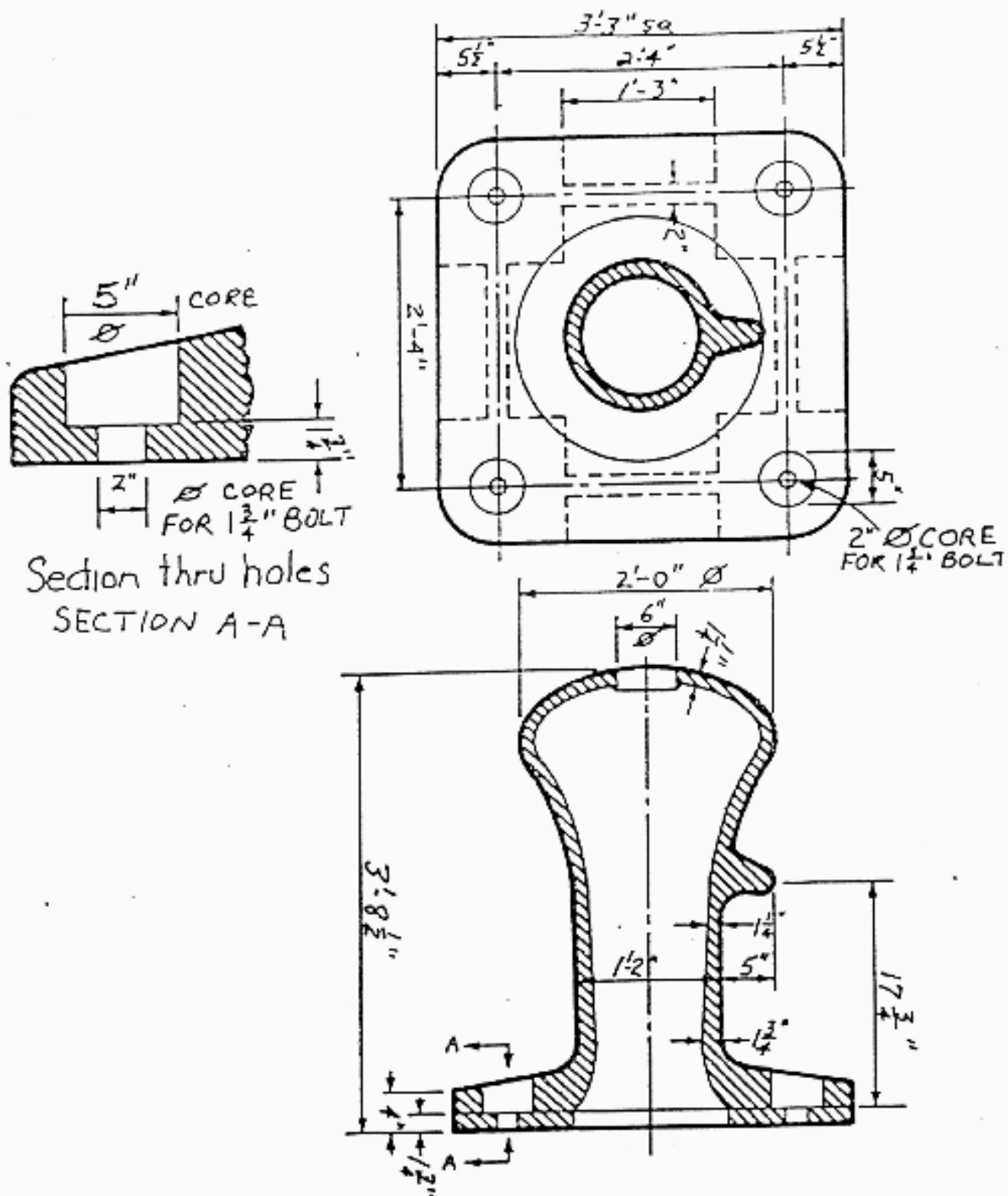
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CAPACITY 50 TONS



BOLLARD CAST STEEL

BULLARD—CAST STEEL



BLUE WATER MARINE

DIVISION

INTERNATIONAL MARINE & SPECIALTY SUPPLY INC.

P.O. BOX 266599 • HOUSTON, TEXAS 77207-6599 USA

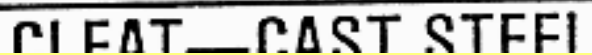
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	CLEAR - CRACK STEEL
	 BLUE WATER MARINE DIVISION
	INTERNATIONAL MARINE & SPECIALTY SUPPLY INC. P.O. BOX 266599 • HOUSTON, TEXAS 77207-8599 USA TELEPHONE: (713) 645-0182 • TELEX: 775183 • FAX: (713) 643-2292
PART NO. C20-2614.25	

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NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

THEORETICAL ALLOWABLE HORIZONTAL LOADING ON BERTHS

BERTH	NO. OF BATTER PILES PER BERTH- STRUCTURE TYPE	LATERAL PILE CAPACITY K/FT (OFFSHORE)	SOIL LOAD K/FT	ALLOWABLE MOORING LOAD * (K/FT)	ALLOWABLE BERTHING LOAD ** (K/FT)
1	0- BED BACK SEAWALL	UNKNOWN			
2	2 - RELIEVING PLATFORM	6.32	4.9	1.42	3.46
3	2 - RELIEVING PLATFORM	6.32	4.9	1.42	3.46
4	3 - RELIEVING PLATFORM	9.48	4.9	4.58	3.46
5	3 - RELIEVING PLATFORM	9.48	4.9	4.58	3.46
6	3 - RELIEVING PLATFORM	9.48	4.9	4.58	3.46
7	2 - RELIEVING PLATFORM	6.32	4.9	1.42	3.46
8	2 - RELIEVING PLATFORM	6.32	4.9	1.42	3.46
9	OPEN PIER	1.375	0	1.375	3.46
10	OPEN PIER	3.71	0	3.71	3.46
11	2 - RELIEVING PLATFORM	6.32	4.9	1.42	3.46
12	2 - RELIEVING PLATFORM	6.32	4.9	1.42	3.46
13	OPEN PIER	UNKNOWN			
14	OPEN PIER	.50	0	N/A	3.46
15	OPEN PIER	.50	0	N/A	3.46
16	OPEN PIER	.40	0	N/A	3.46
17	OPEN PIER	.40	0	N/A	3.46
18	OPEN PIER	1.37	0	1.37	3.46
19	OPEN PIER	1.37	0	1.37	3.46
20	OPEN PIER	UNKNOWN			
22 - 24	3 - RELIEVING PLATFORM	9.48	4.9	4.58	3.46
25	2 - RELIEVING PLATFORM	6.32	4.9	1.42	3.46
26 - 30	0 - RELIEVING PLATFORM	5.6	NA	5.6	3.46
31	4 - RELIEVING PLATFORM	12.64	4.9	7.74	3.46
32 - 33	0 - RELIEVING PLATFORM	5.6	NA	5.6	3.46
34	3 - RELIEVING PLATFORM	9.48	4.9	4.58	3.46
35 - 36	0 - RELIEVING PLATFORM	5.6	NA	5.6	3.46
37	3 - RELIEVING PLATFORM	9.48	4.9	4.58	3.46
38 - 39	3 - RELIEVING PLATFORM	9.48	4.9	4.58	3.46
40	OPEN PIER	UNKNOWN			
41	OPEN PIER	UNKNOWN			
42 - 43	3 - RELIEVING PLATFORM	9.48	4.9	4.58	3.46

Note: The figures presented in this table are approximate and should only be used for planning. To determine the actual forces acting on the structures additional investigation is required. The calculations used to determine these forces have not accounted for the condition of the structure, soil conditions, as-built conditions etc....

8/28/99 - All weather piles, installed, in place.

100% - no better price, restraint unknown.

* Allowable mooring load determined by approximate methods. Resisting capacity was calculated as well as active soil pressure. The difference was found to be available mooring load per foot of berth.

* * Allowable berthing load determined by approximate methods. Values listed are controlled by timber fender system, other factors should be considered such as allowable hull pressure and variations in the fender system.

This table is not to be used for design purposes.

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NORFOLK NAVAL SHIPYARD MOORING CONDITION REPORT

SUMMARY OF FITTING CAPACITIES

FITTING TYPE	CHARACTERISTICS	ALLOWABLE HORIZONTAL LOAD	ALLOWABLE LOAD @ 45DEG
BOLLARD	4 BOLT WITH 39" BASE	50 TONS	33 TONS**
MOORING POST	4 BOLT WITH 39" BASE	84 TONS	34 TONS**
LOW DOUBLE BIT	10 BOLT	61 TONS	37 TONS**
HIGH DOUBLE BIT	10 BOLT	43 TONS	31 TONS**
42" CLEAT	TYPE 1	20 TONS	20 TONS
42" CLEAT	TYPE 2	20 TONS	20 TONS
42" CLEAT	TYPE 3	20 TONS	20 TONS
26' CLEAT	OVAL BASE WITH 4 BOLTS	12 TONS *	12 TONS *
30' CLEAT	4 BOLTS	10 TONS	10 TONS *
24' CLEAT	2 BOLTS	7 TONS *	7 TONS *
40' CLEAT	UNKNOWN	UNKNOWN	UNKNOWN
12" DIA. PIPE	UNKNOWN	UNKNOWN	UNKNOWN
SINGLE BITT	16" BARREL	55 TONS *	55 TONS *
M BOLLARD	4 BOLT WITH 45" BASE	UNKNOWN	UNKNOWN
SHORT BOLLARD	4 BOLTS WITH 39" BASE	UNKNOWN	UNKNOWN
SM BOLLARD	4 BOLTS WITH 39" BASE	UNKNOWN	UNKNOWN
CANNON	CANNON BARRELS SET IN CONCRETE BASE	UNKNOWN	UNKNOWN
WINDLASS	HAND OPERATED	6.75 TONS *	UNKNOWN
CAPSTAN	MECHANICALLY OPERATED HEAVY DUTY	SEE CAPSTAN TABLE	SEE CAPSTAN TABLE

* CALCULATED ALLOWABLE LOAD BASED ON ASSUMPTIONS MADE WITH LIMITED AVAILABLE DATA.

** HORIZONTAL COMPONENT OF LINE PULL

NOTE:

Allowable horizontal loads and loads @ 45 deg. shown on this table are based on load rating of manufacturers of similar fittings. Actual design data for fittings in the field is unknown.

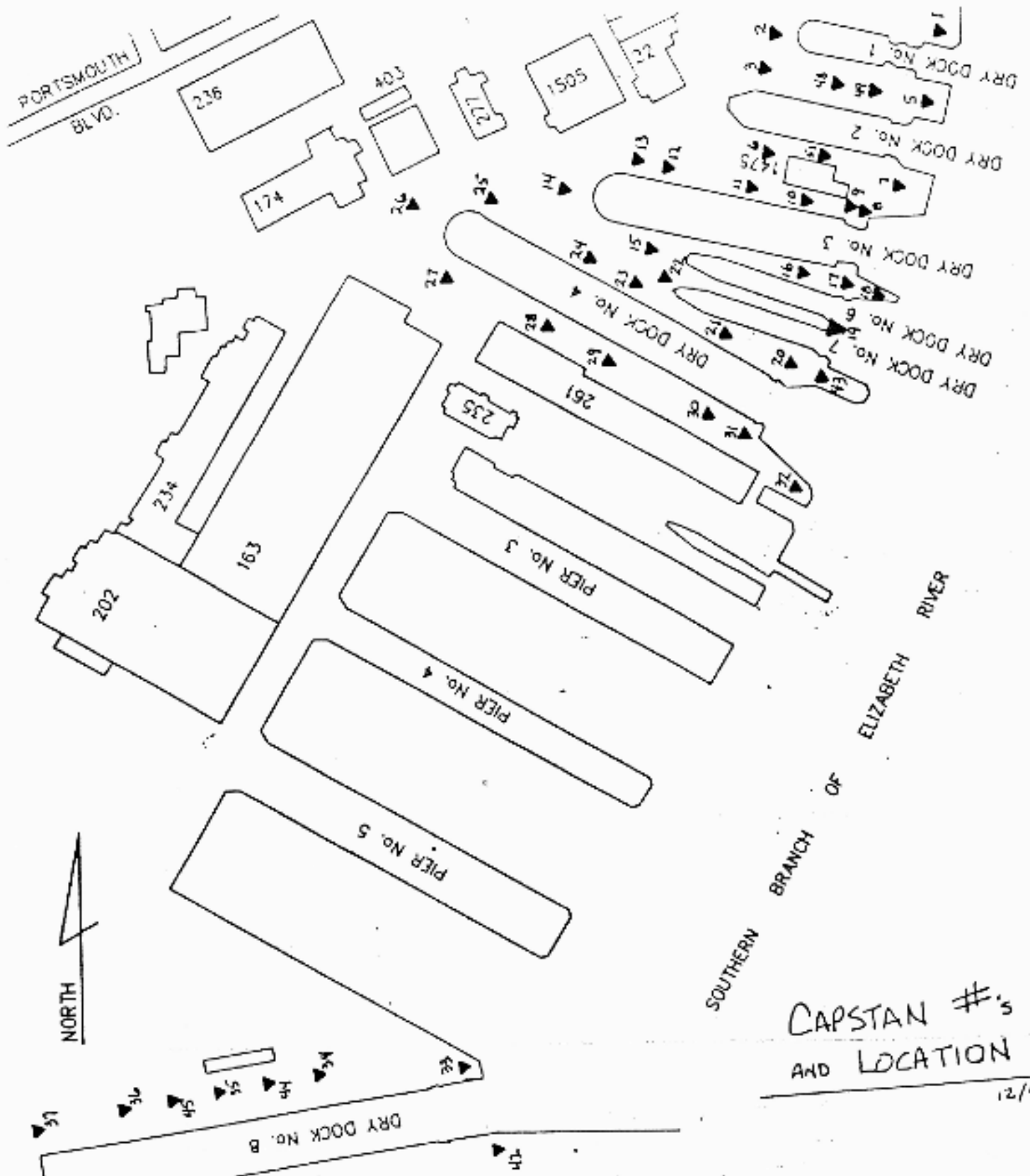
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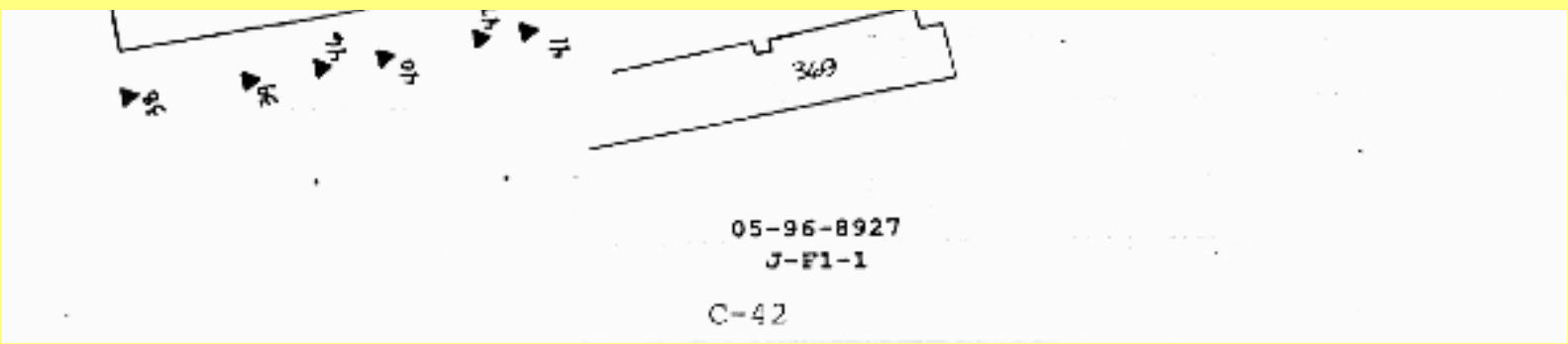
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ATTACHMENT J-F1





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NNSY CAPSTAN INFORMATION: June 96

CAP #	DATE CONSTR.	LOCATION	ELECT FEED	H.P.	MOTOR TYPE	MFG	RATED LOAD 60 f.p.m.	30 f.p.m.	STATIC LOAD	TEST DATE	FORWARD: 10 SPD	REVERSE 10 SPD	LOW SPD	LOW SPD
1	1957	N.S. DD1	V 1	20	GKH	Superior	6K	12K	60K	?				
2	Mar 90	HD. DD1	G 1	40	CJ-15	N.E.T.	15K	30K	100K	1/23/93	20,500	20,500	20,500	20,500
3	Mar 90	S.S. DD1	G 1	40	CJ-15	N.E.T.	15K	30K	100K	4/20/96	20,300	20,300	20,300	20,300
4		S.S. DD1												
5	1969	N.S. DD2	G 1	25	KR	Sandus	6K	12K	60K	4/20/96	12,800	12,800	N/A	N/A
6	Mar 90	S.S. DD2	FC 1	40	CJ-15	N.E.T.	15K	30K	100K	1/23/93	20,000	22,000	22,000	21,000
7	Mar 90	S.S. DD2	FC 1	40	CJ-15	N.E.T.	15K	30K	100K	3/9/96	15,000	26,700	17,000	27,000
8	Mar 90	N.S. DD3	FC 1	40	CJ-15	N.E.T.	15K	30K	100K	3/25/95	15,500	28,000	14,100	28,000
9	Mar 90	N.S. DD3	FC 1	40	CJ-15	N.E.T.	15K	30K	100K					
10	Mar 90	N.S. DD3	FC 1	40	CJ-15	N.E.T.	15K	30K	100K	1/15/93	23,000	22,500	23,000	22,000
11	Mar 90	N.S. DD3	FC 1	40	CJ-15	N.E.T.	15K	30K	100K	3/25/95	13,500	29,000	14,800	27,300
12	1964	N.S. DD3	FA 409	20	GKH	Superior	6K	12K	60K					
13	Mar 90	N.S. DD3	FC 4	40	CJ-15	N.E.T.	15K	30K	100K	3/9/96	19,400	27,600	18,600	27,000
14	Mar 90	HD. DD3	FC 4	40	CJ-15	N.E.T.	15K	30K	100K	4/1/95	10,100	29,900	14,900	26,400
15	Jan 90	S.S. DD3	4 PW	40	KR	A.C. Hoyle	15K	30K	100K	3/25/95	13,100	28,000	13,100	29,000
16	Mar 90	S.S. DD3	FC 4	40	CJ-15	N.E.T.	15K	30K	100K	2/11/95	15,000	26,800	14,500	27,800
17	Mar 90	S.S. DD3	FC 4	40	CJ-15	N.E.T.	15K	30K	100K	2/11/95	15,300	26,100	14,800	28,300
18	Mar 90	S.S. DD3	FC 4	40	CJ-15	N.E.T.	15K	30K	100K					
19	Mar 90	Bel. B7	PIC 19	40	CJ-15	N.E.T.	15K	30K	100K	4/20/95	19,500	30,500	20,100	30,200
20	Jan 90	N.S. DD4	4 PW	40	KR	A.C. Hoyle	15K	30K	100K	4/3/93	25,600	22,000	21,200	21,400
21	Mar 90	N.S. DD4	PIC 20	40	CJ-15	N.E.T.	15K	30K	100K					
22	Jan 90	HD. DD7	4 PW	40	KR	A.C. Hoyle	15K	30K	100K	3/9/95	N/A	22,200	N/A	27,000
23	Jan 90	N.S. DD4	4 PW	40	KR	A.C. Hoyle	15K	30K	100K	5/21/93	23,300	22,400	25,000	21,600
24	Jan 90	N.S. DD4	4 PW	40	KR	A.C. Hoyle	15K	30K	100K	2/24/96	18,000	27,700	15,000	28,000
25	Mar 90	N.S. DD4	PIC 19	40	CJ-15	N.E.T.	15K	30K	100K	2/24/95	17,100	28,500	18,750	25,800
26	Jan 90	HD. DD4	4 PW	40	KR	A.C. Hoyle	15K	30K	100K	6/11/93	20,700	20,900	26,800	21,900
27	Mar 90	S.S. DD4	H 3	40	CJ-15	N.E.T.	15K	30K	100K	6/11/93	21,000	21,400	27,200	20,300
28	1957	S.S. DD4	H 3	20	GKH	Superior	6K	12K	60K					
29	Jan 90	S.S. DD4	4 PW	40	KR	A.C. Hoyle	15K	30K	100K	3/9/95	16,600	28,500	20,900	26,800
30	Mar 90	S.S. DD4	PIC 19	40	CJ-15	N.E.T.	15K	30K	100K	5/19/93	22,900	20,200	20,800	20,800
31	Jan 90	S.S. DD4	4 PW	40	KR	A.C. Hoyle	15K	30K	100K	4/20/95	17,200	33,500	17,300	39,000
32	Jan 90	S.S. DD4	4 PW	40	KR	A.C. Hoyle	15K	30K	100K	5/24/93	23,600	22,500	25,400	21,600
33	Sep 94	N.S. DD8	73 421	40	CJ-15	N.E.T.	15K	30K	100K					
34	1942	N.S. DD8	23 421	20	KR	Silent Hoist	6K	12K	60K	2/11/95	N/A	11,900	N/A	11,900
35	1942	N.S. DD8	23 401	20	KR	Silent Hoist	6K	12K	60K	3/25/95	N/A	11,200	N/A	13,800
36	1942	N.S. DD8	23 401	20	KR	Silent Hoist	6K	12K	60K	2/24/96	N/A	27,600	N/A	24,900
37	1942	N.S. DD8	23 401	40	KR	Silent Hoist	12K	24K	80K	6/11/95	N/A	26,000	N/A	28,100
38	1942	S.S. DD8	24 442	40	KR	Silent Hoist	12K	24K	80K	2/24/96	N/A	22,300	N/A	21,000
39	1942	S.S. DD8	24 442	20	KR	Silent Hoist	6K	12K	60K	3/25/95	N/A	11,000	N/A	10,700
40	1942	S.S. DD8	24 442	20	KR	Silent Hoist	6K	12K	60K	2/11/95	N/A	10,800	N/A	13,200
41	1942	S.S. DD8	24 452	20	KR	Silent Hoist	6K	12K	60K	2/11/95	8,400	11,200	6,100	10,600
42	Sep 94	S.S. DD8	24 452	40	CJ-15	N.E.T.	15K	30K	100K	7/31/93	21,000	20,300	20,250	21,600
43	Sep 94	N.S. DD4	PIC 20	40	CJ-15	N.E.T.	15K	30K	100K	5/24/93	N/A	23,100	21,750	
44	1960	N.S. DD8	23 421	20	GKH	Superior	6K	12K	60K					
45	1960	N.S. DD8	23 401	20	GKH	Superior	6K	12K	60K					
46	1960	S.S. DD8	24 442	20	GKH	Superior	6K	12K	60K					
47	1960	S.S. DD8	24 452	20	GKH	Superior	6K	12K	60K					
48	Sep 94	N.S. DD2	G 1	40	CJ-15	N.E.T.	15K	30K	100K					
49	Sep 94	N.S. DD2	G 1	40	CJ-15	N.E.T.	15K	30K	100K					
50	(Does not exist)													
51	Sep 94	S.S. DD2	FA 409	40	CJ-15	N.E.T.	15K	30K	100K					

[PREVIOUS PAGE](#)[BACK TO MAIN PAGE](#)

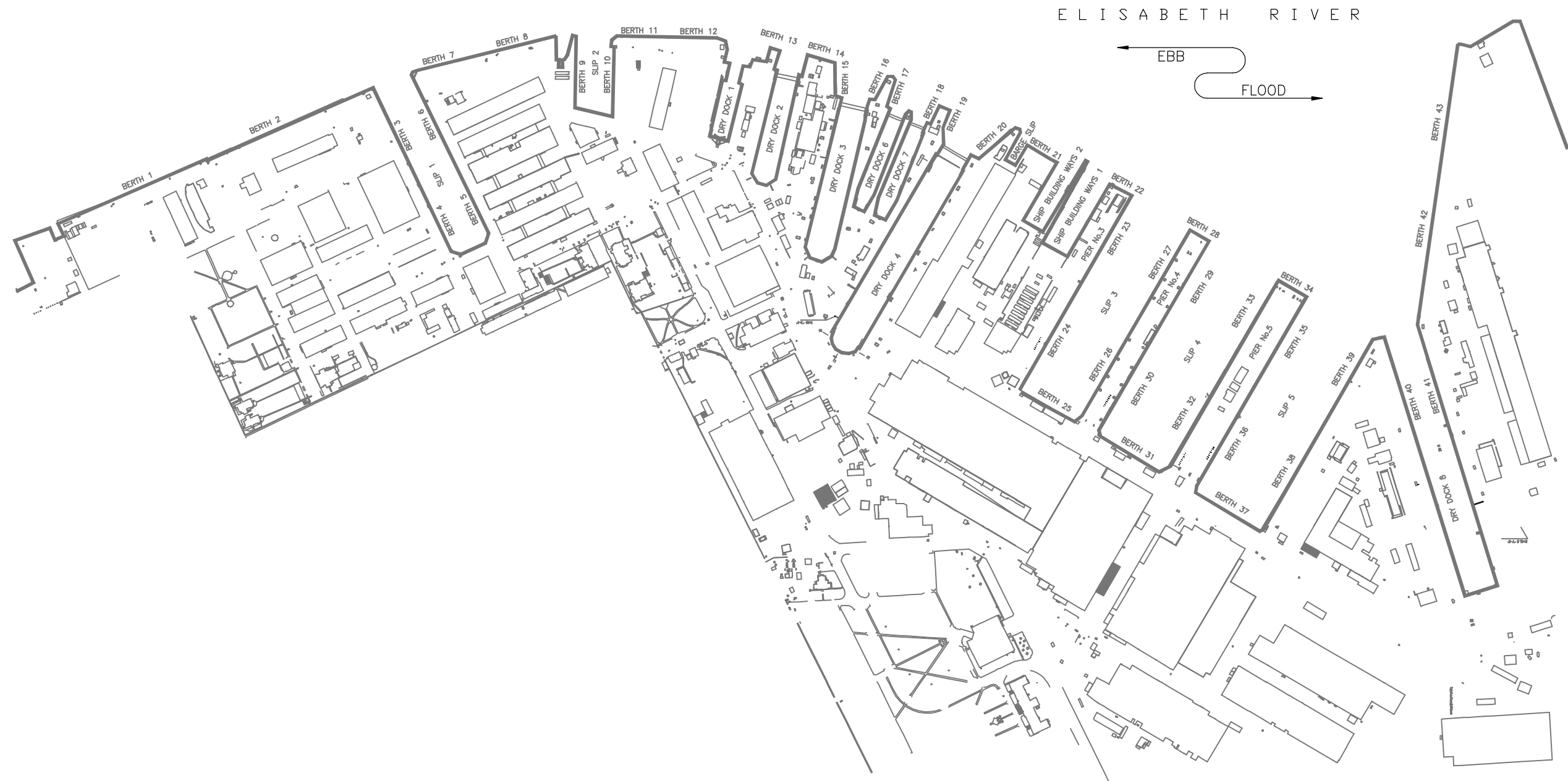
APPENDIX C

CALCULATIONS

The following are links to scanned pages of calculations and reference data:

page 1	page 2	page 3	page 4	page 5	page 6	page 7
page 8	page 9	page 10	page 11	page 12	page 13	page 14
page 15	page 16	page 17	page 18	page 19	page 20	page 21
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or [Click here to browse through them in order.](#)



GRAPHIC SCALE

500' 250' 0 500'

SCALE: 1"=500'-0"

CHILD'S ENGINEERING
CORPORATION
BOX 333 MEDFIELD, MA

DATE: SEPTEMBER, 1999

CONTRACT NUMBER
N47408-96-D-4058

NAVAL FACILITIES ENGINEERING SERVICE CENTER
EAST COAST DETACHMENT
WASHINGTON, D.C.

NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA

FACILITY MAP



FIG.No.
2-3

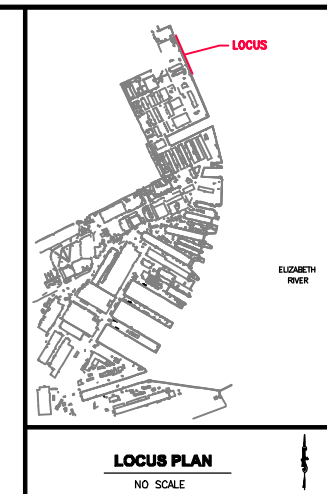
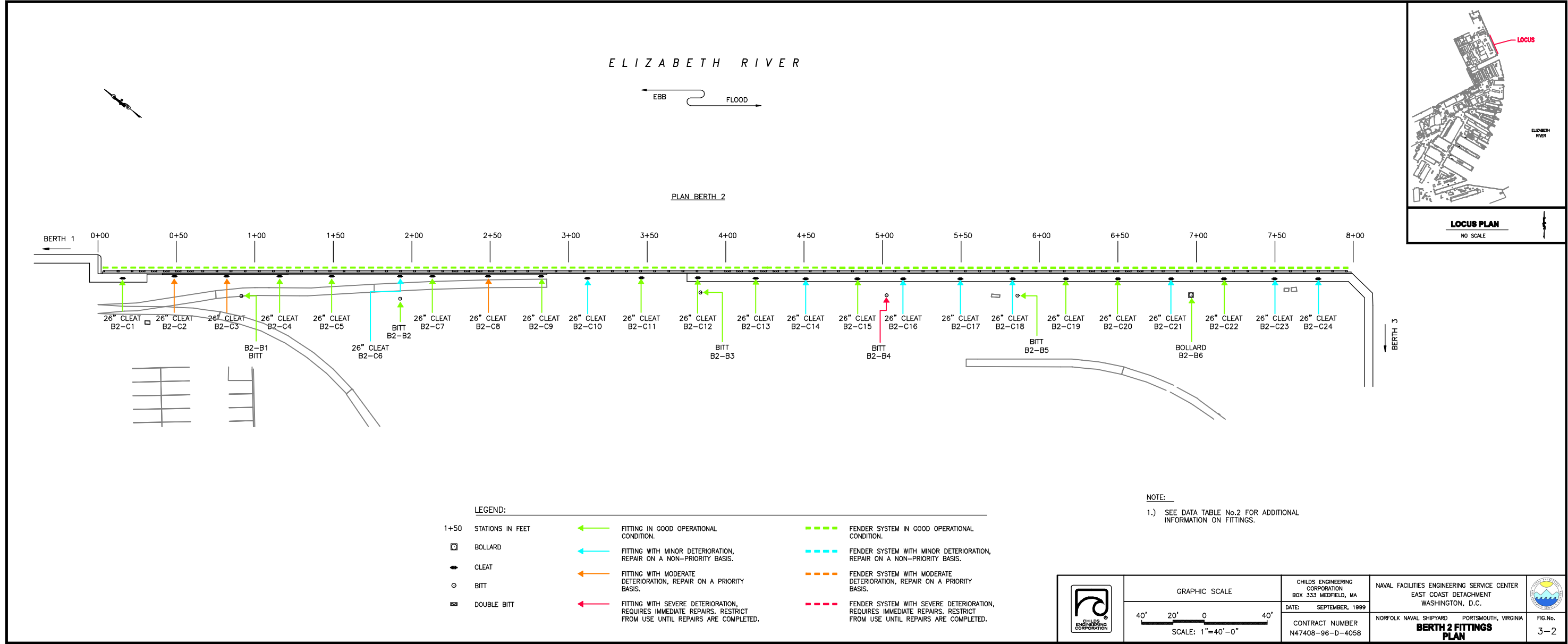
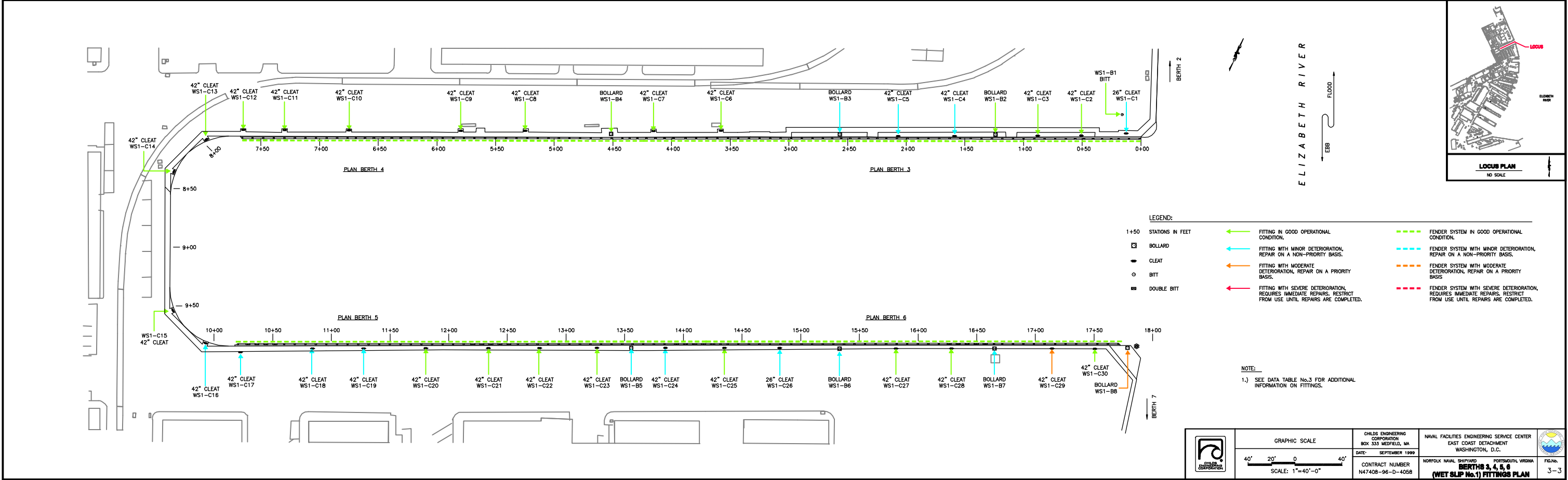
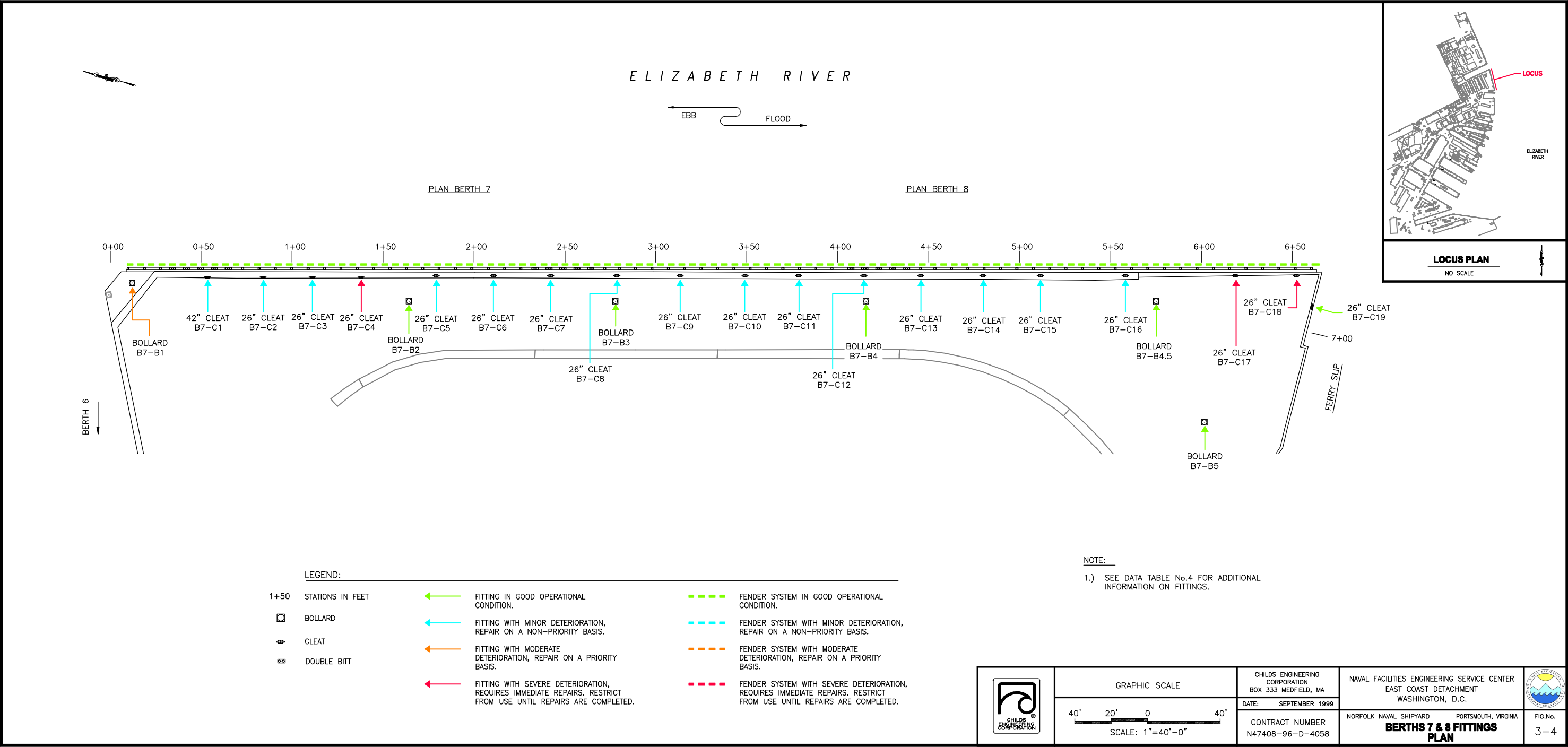
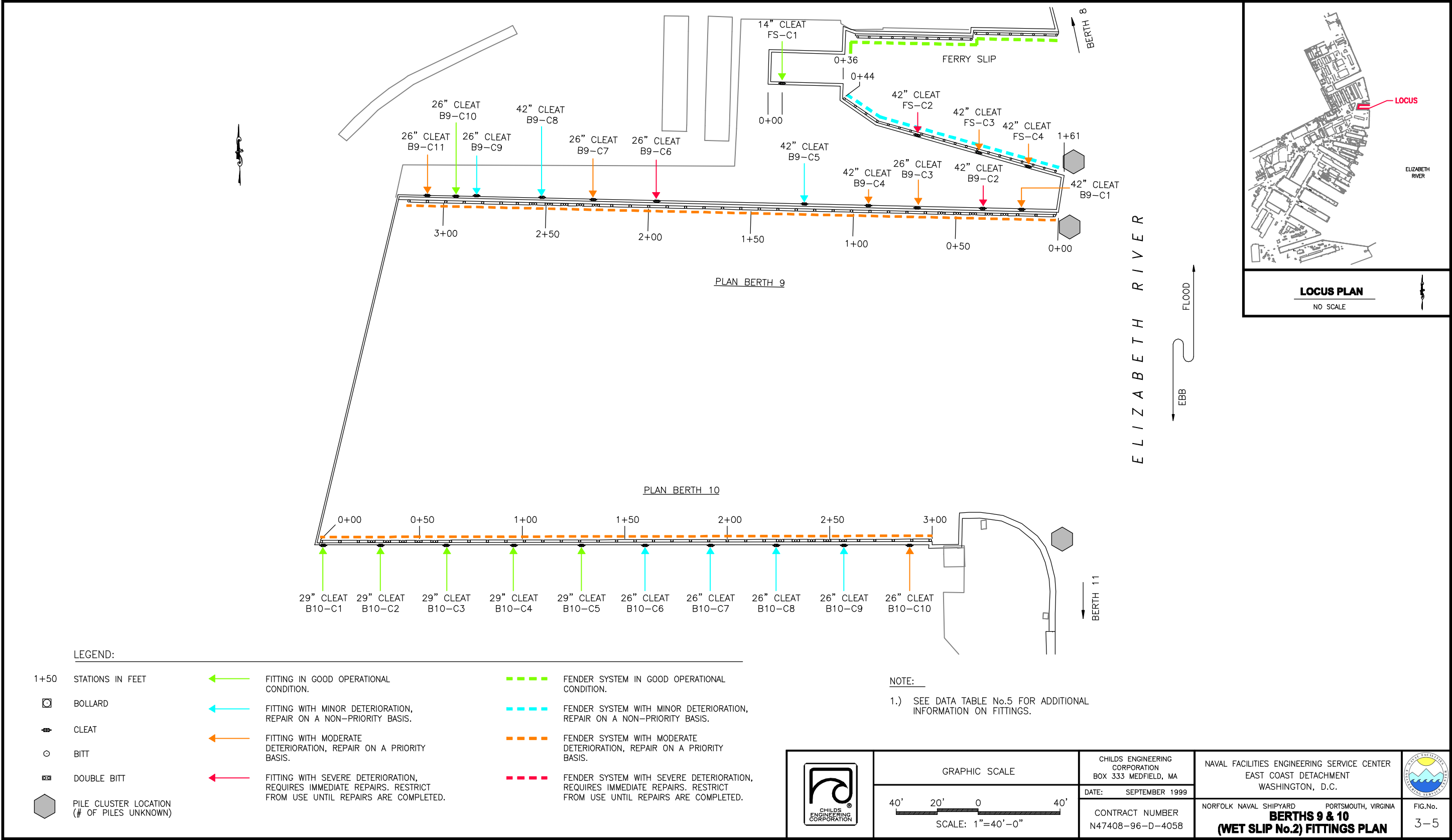


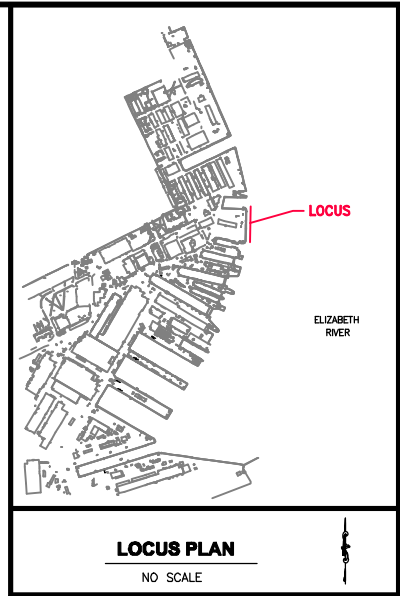
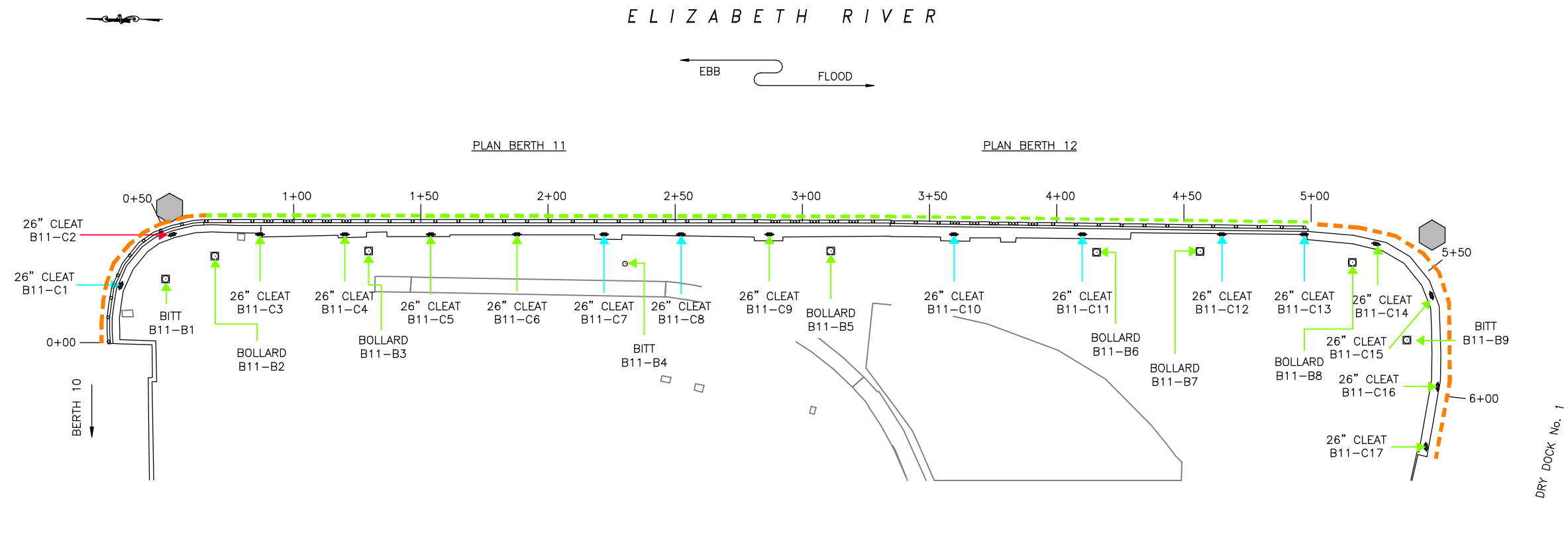
FIG.No.
3-1











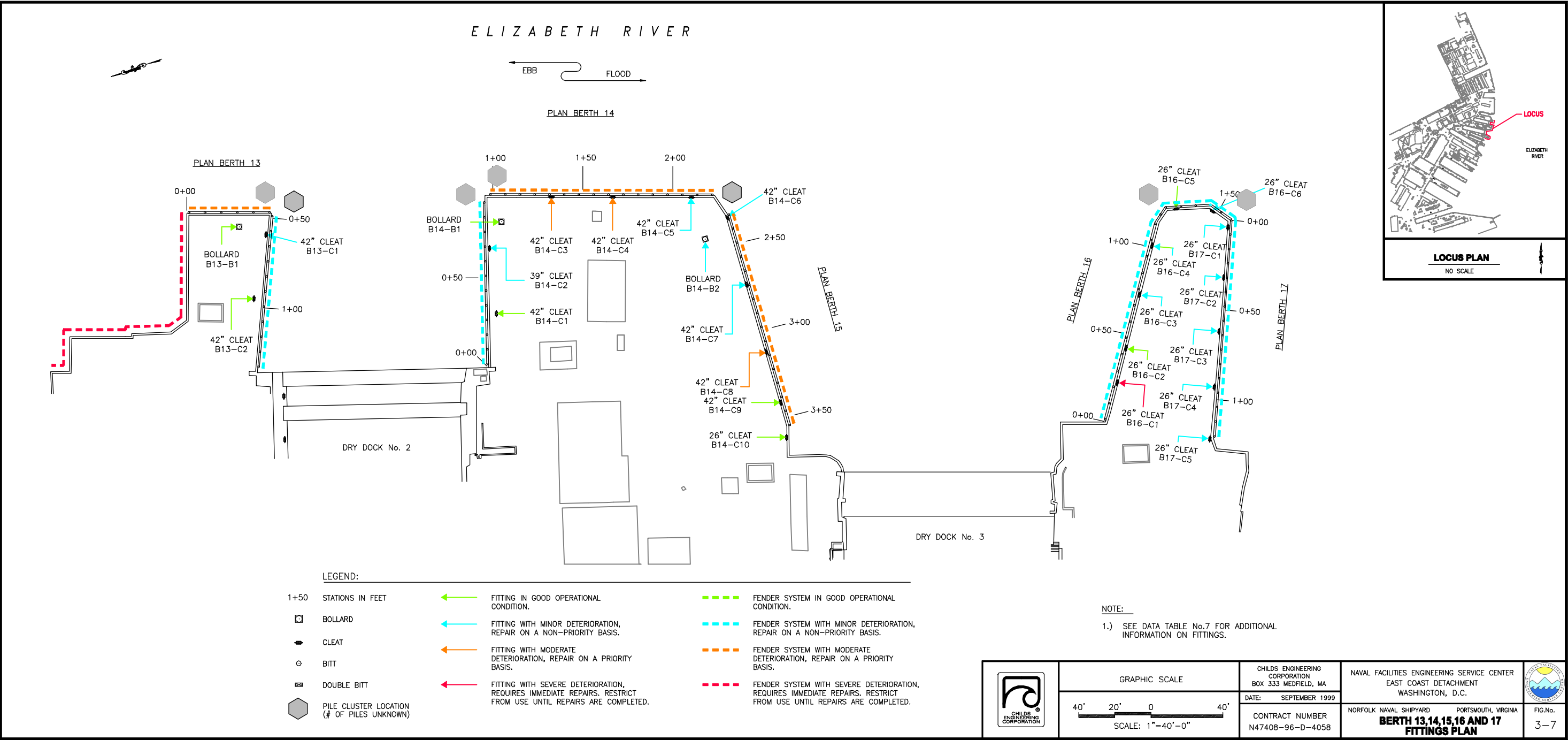
LEGEND:

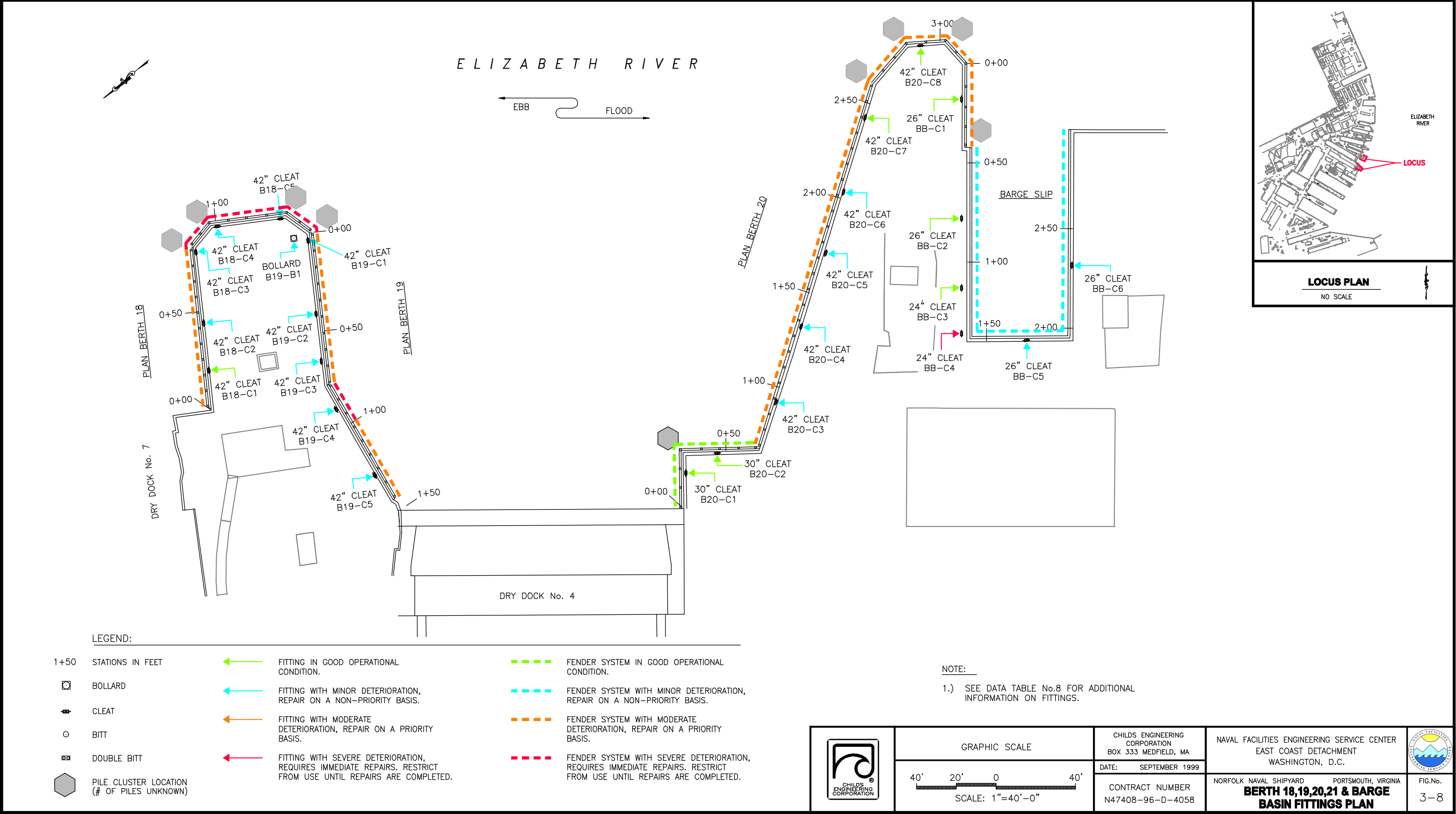
1+50	STATIONS IN FEET		FITTING IN GOOD OPERATIONAL CONDITION.		FENDER SYSTEM IN GOOD OPERATIONAL CONDITION.
	BOLLARD		FITTING WITH MINOR DETERIORATION, REPAIR ON A NON-PRIORITY BASIS.		FENDER SYSTEM WITH MINOR DETERIORATION, REPAIR ON A NON-PRIORITY BASIS.
	CLEAT		FITTING WITH MODERATE DETERIORATION, REPAIR ON A PRIORITY BASIS.		FENDER SYSTEM WITH MODERATE DETERIORATION, REPAIR ON A PRIORITY BASIS.
	BITT		FITTING WITH SEVERE DETERIORATION, REQUIRES IMMEDIATE REPAIRS. RESTRICT FROM USE UNTIL REPAIRS ARE COMPLETED.		FENDER SYSTEM WITH SEVERE DETERIORATION, REQUIRES IMMEDIATE REPAIRS. RESTRICT FROM USE UNTIL REPAIRS ARE COMPLETED.
	DOUBLE BITT				
	PILE CLUSTER LOCATION (# OF PILES UNKNOWN)				

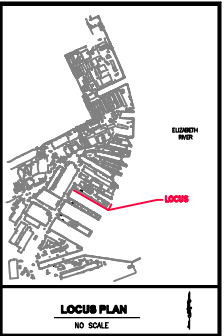
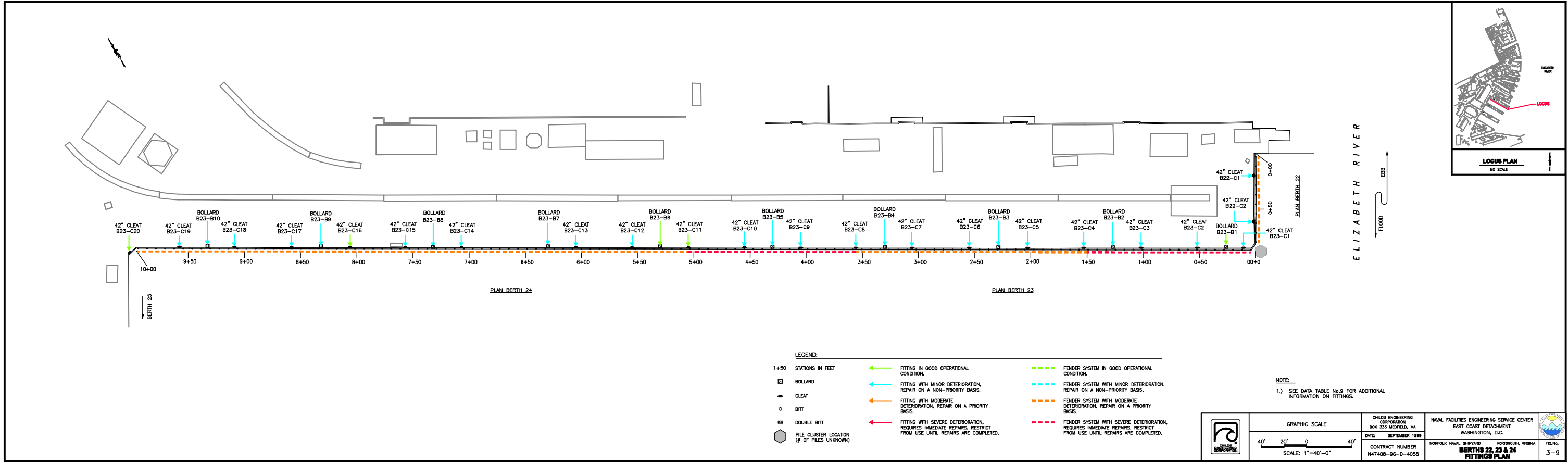
NOTE:

- 1.) SEE DATA TABLE No.6 FOR ADDITIONAL INFORMATION ON FITTINGS.

	<p>GRAPHIC SCALE</p> <p>SCALE: 1"=40'-0"</p>	<p>CHILDS ENGINEERING CORPORATION BOX 333 MEDFIELD, MA</p>	<p>NAVAL FACILITIES ENGINEERING SERVICE CENTER EAST COAST DETACHMENT WASHINGTON, D.C.</p>	
		<p>DATE: SEPTEMBER 1999</p>		
		<p>CONTRACT NUMBER N47408-96-D-4058</p>	<p>NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA</p>	<p>FIG.No. 3-6</p>
			<p>BERTH 11 & 12 FITTINGS PLAN</p>	







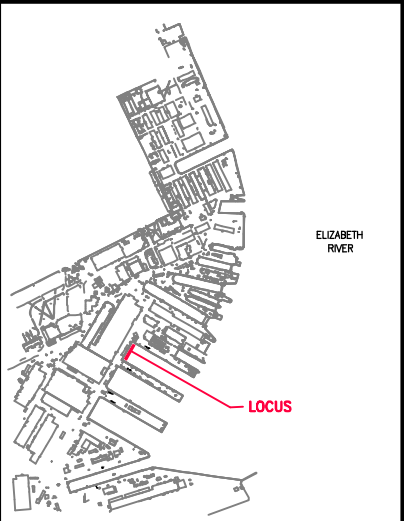
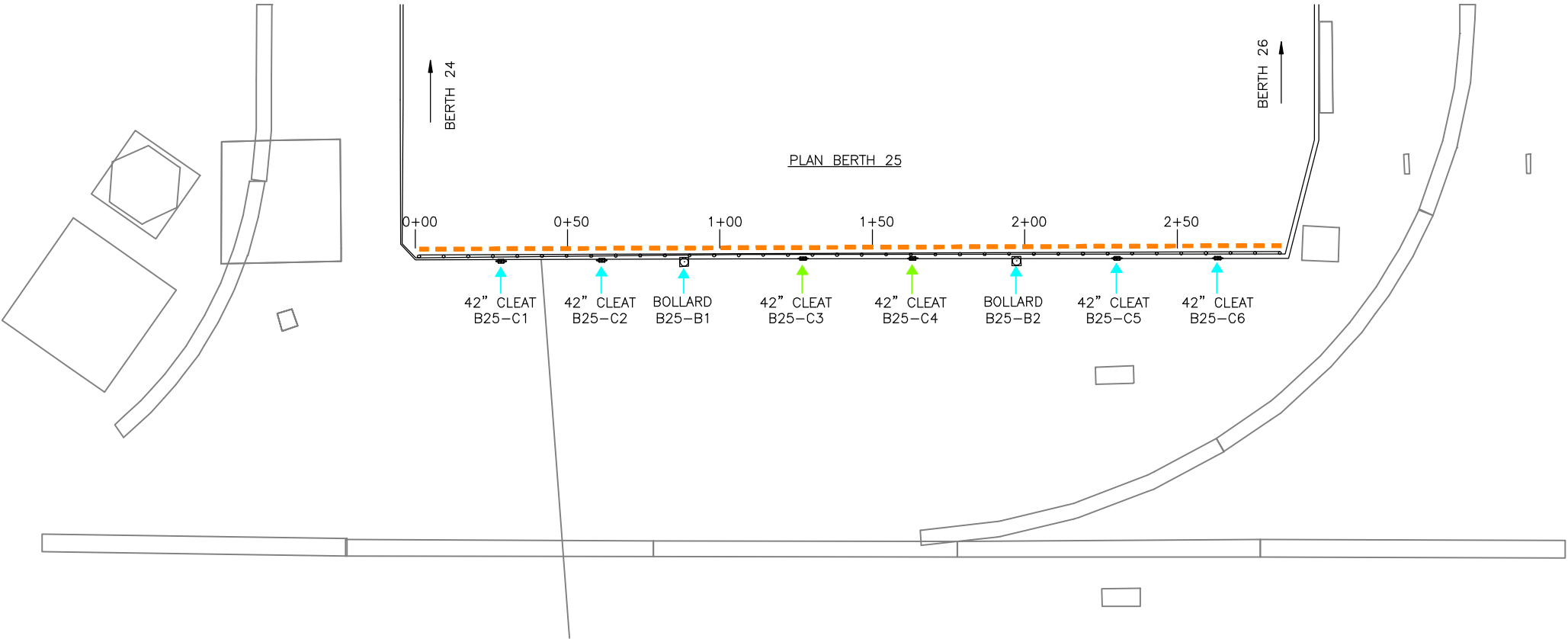
- LEGEND:
- | | | |
|--|---|---|
| 1+50 STATIONS IN FEET | FITTING IN GOOD OPERATIONAL CONDITION. | FENDER SYSTEM IN GOOD OPERATIONAL CONDITION. |
| BOLLARD | FITTING WITH MINOR DETERIORATION, REPAIR ON A NON-PRIORITY BASIS. | FENDER SYSTEM WITH MINOR DETERIORATION, REPAIR ON A NON-PRIORITY BASIS. |
| CLEAT | FITTING WITH MODERATE DETERIORATION, REPAIR ON A PRIORITY BASIS. | FENDER SYSTEM WITH MODERATE DETERIORATION, REPAIR ON A PRIORITY BASIS. |
| BITT | FITTING WITH SEVERE DETERIORATION, REQUIRES IMMEDIATE REPAIRS, RESTRICT FROM USE UNTIL REPAIRS ARE COMPLETED. | FENDER SYSTEM WITH SEVERE DETERIORATION, REQUIRES IMMEDIATE REPAIRS, RESTRICT FROM USE UNTIL REPAIRS ARE COMPLETED. |
| DOUBLE BITT | | |
| PILE CLUSTER LOCATION (# OF PILES UNKNOWN) | | |

NOTE:
1.) SEE DATA TABLE No.9 FOR ADDITIONAL INFORMATION ON FITTINGS.

	GRAPHIC SCALE	CHLDS ENGINEERING CORPORATION BOX 333 WELFLE, MA	NAVAL FACILITIES ENGINEERING SERVICE CENTER EAST COAST DETACHMENT WASHINGTON, D.C.	
	40' 20' 0 40'	DATE: SEPTEMBER 1999		
	SCALE: 1"=40'-0"	CONTRACT NUMBER N47408-96-D-4056	NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA BERTHS 23 & 24 FITTINGS PLAN	



ELIZABETH RIVER

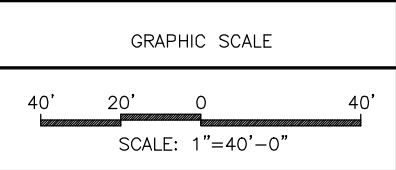


LOCUS PLAN
NO SCALE

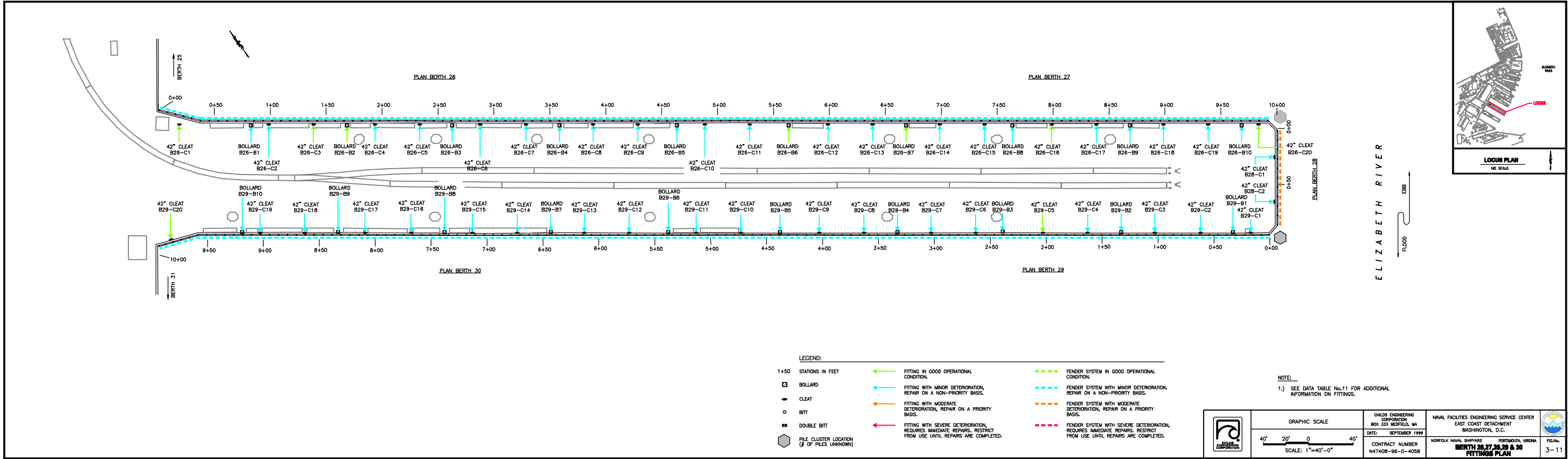
LEGEND:

1+50	STATIONS IN FEET		FITTING IN GOOD OPERATIONAL CONDITION.		FENDER SYSTEM IN GOOD OPERATIONAL CONDITION.
	BOLLARD		FITTING WITH MINOR DETERIORATION, REPAIR ON A NON-PRIORITY BASIS.		FENDER SYSTEM WITH MINOR DETERIORATION, REPAIR ON A NON-PRIORITY BASIS.
	CLEAT		FITTING WITH MODERATE DETERIORATION, REPAIR ON A PRIORITY BASIS.		FENDER SYSTEM WITH MODERATE DETERIORATION, REPAIR ON A PRIORITY BASIS.
	BITT		FITTING WITH SEVERE DETERIORATION, REQUIRES IMMEDIATE REPAIRS. RESTRICT FROM USE UNTIL REPAIRS ARE COMPLETED.		FENDER SYSTEM WITH SEVERE DETERIORATION, REQUIRES IMMEDIATE REPAIRS. RESTRICT FROM USE UNTIL REPAIRS ARE COMPLETED.
	DOUBLE BITT				

NOTE:
1.) SEE DATA TABLE No.10 FOR ADDITIONAL INFORMATION ON FITTINGS.

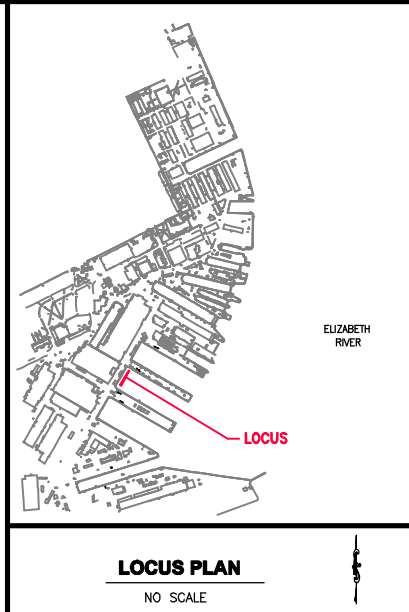
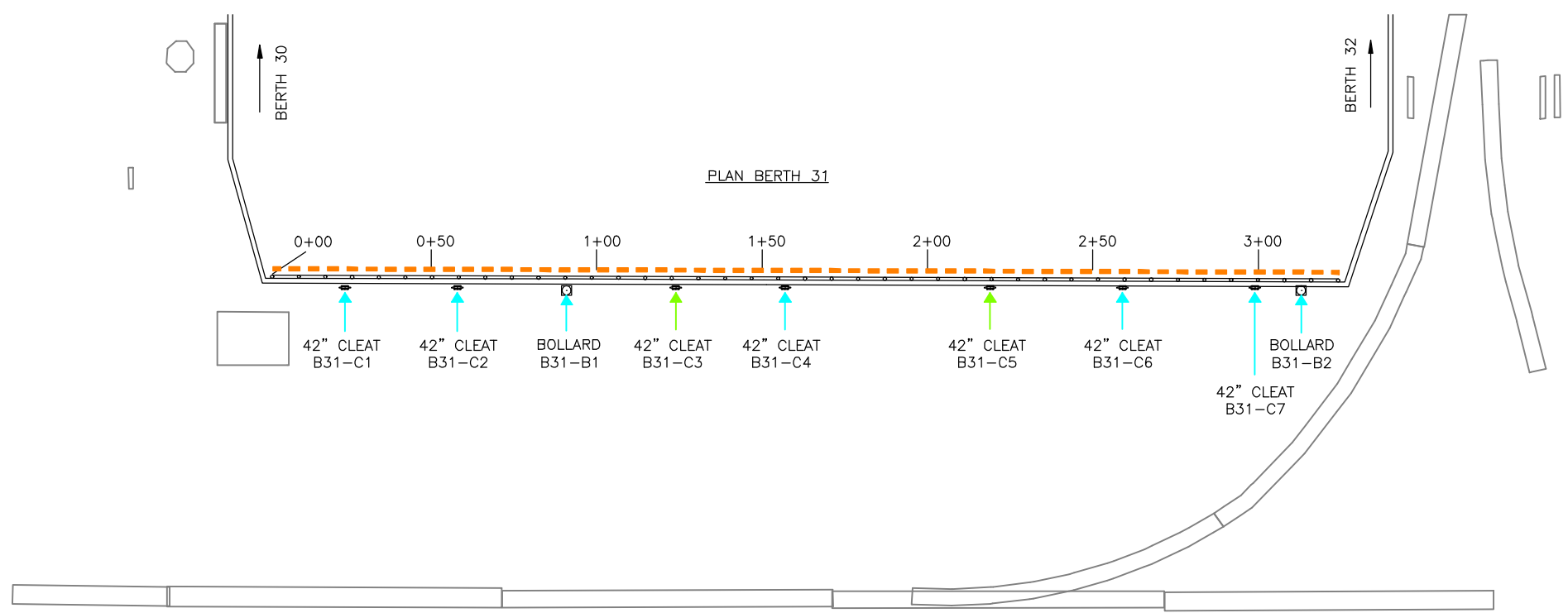


CHILDS ENGINEERING CORPORATION BOX 333 MEDFIELD, MA	NAVAL FACILITIES ENGINEERING SERVICE CENTER EAST COAST DETACHMENT WASHINGTON, D.C.	
DATE: SEPTEMBER 1999	NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA	FIG.No.
CONTRACT NUMBER N47408-96-D-4058	BERTH 25 FITTINGS PLAN	3-10





ELIZABETH RIVER

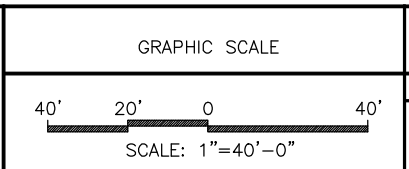


LEGEND:

1+50	STATIONS IN FEET		FITTING IN GOOD OPERATIONAL CONDITION.		FENDER SYSTEM IN GOOD OPERATIONAL CONDITION.
	BOLLARD		FITTING WITH MINOR DETERIORATION, REPAIR ON A NON-PRIORITY BASIS.		FENDER SYSTEM WITH MINOR DETERIORATION, REPAIR ON A NON-PRIORITY BASIS.
	CLEAT		FITTING WITH MODERATE DETERIORATION, REPAIR ON A PRIORITY BASIS.		FENDER SYSTEM WITH MODERATE DETERIORATION, REPAIR ON A PRIORITY BASIS.
	BITT		FITTING WITH SEVERE DETERIORATION, REQUIRES IMMEDIATE REPAIRS. RESTRICT FROM USE UNTIL REPAIRS ARE COMPLETED.		FENDER SYSTEM WITH SEVERE DETERIORATION, REQUIRES IMMEDIATE REPAIRS. RESTRICT FROM USE UNTIL REPAIRS ARE COMPLETED.
	DOUBLE BITT				

NOTE:

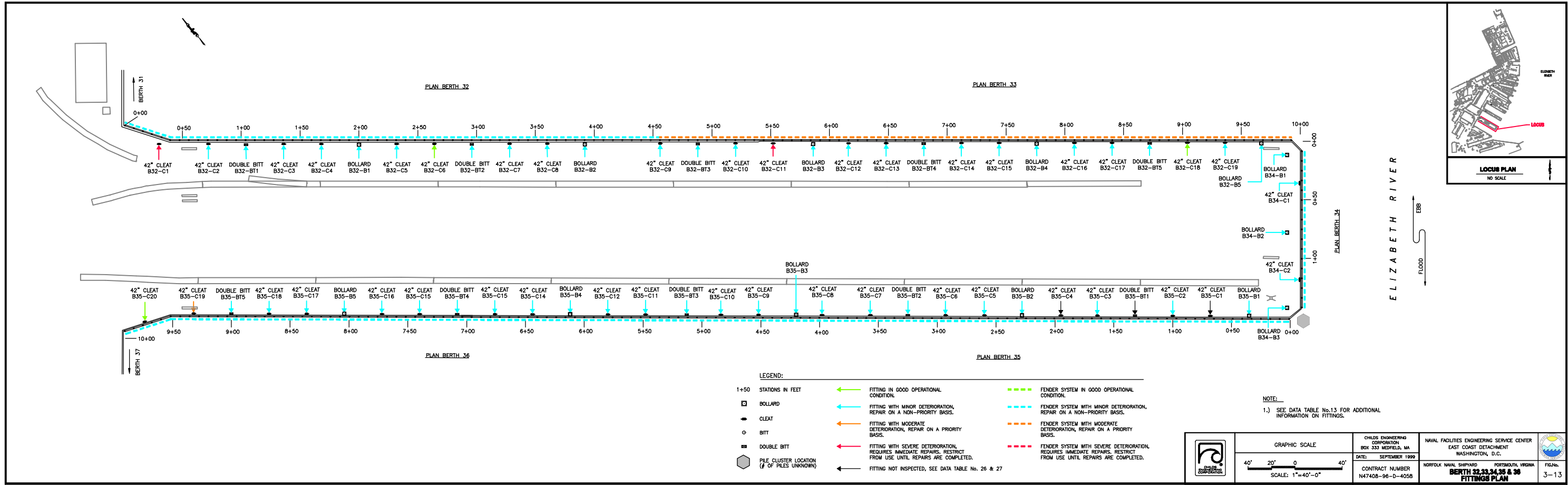
1.) SEE DATA TABLE No.12 FOR ADDITIONAL INFORMATION ON FITTINGS.

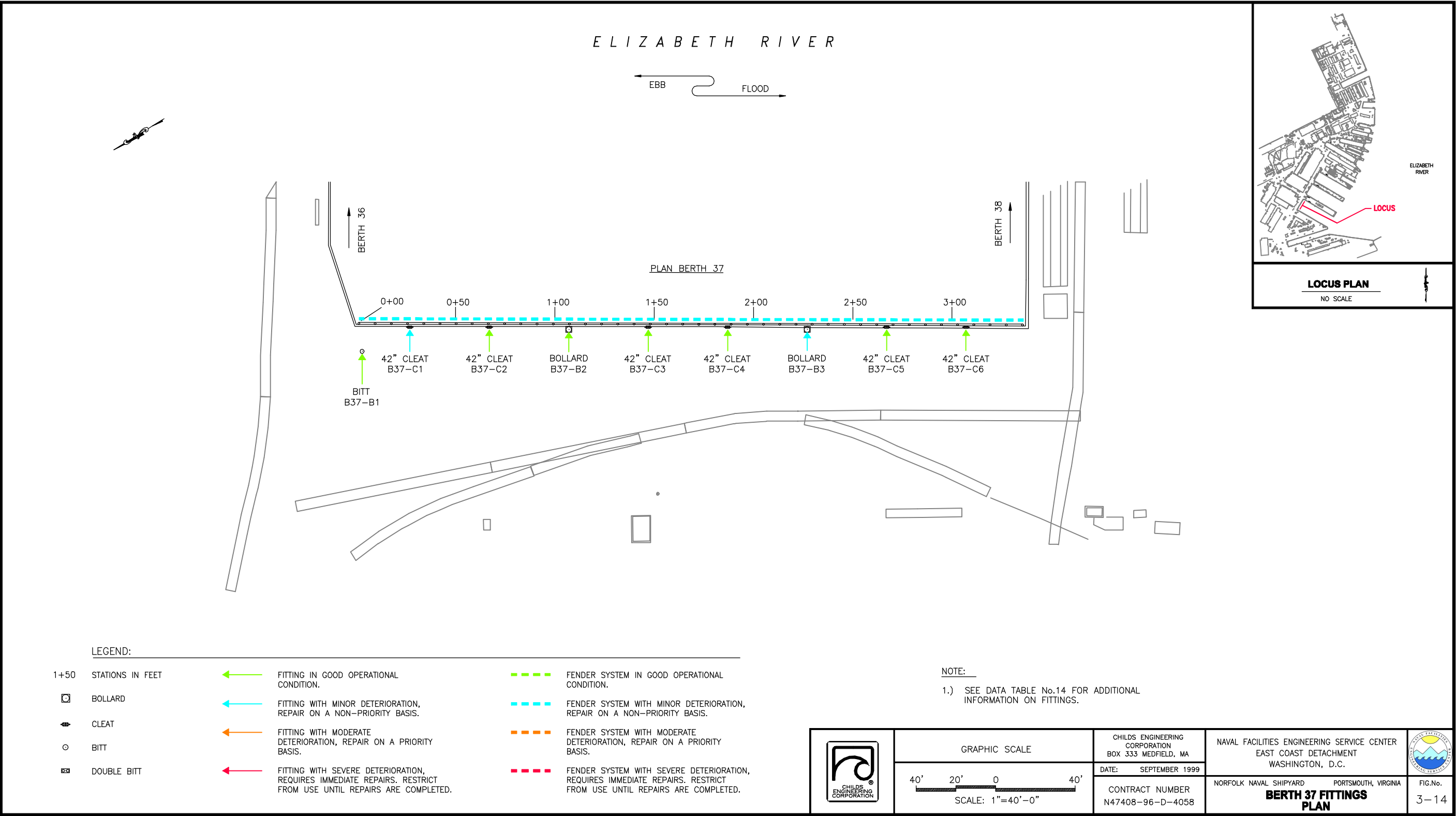


CHILDS ENGINEERING CORPORATION BOX 333 MEDFIELD, MA
DATE: SEPTEMBER 1999
CONTRACT NUMBER N47408-96-D-4058

NAVAL FACILITIES ENGINEERING SERVICE CENTER EAST COAST DETACHMENT WASHINGTON, D.C.
NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA
BERTH 31 FITTINGS PLAN

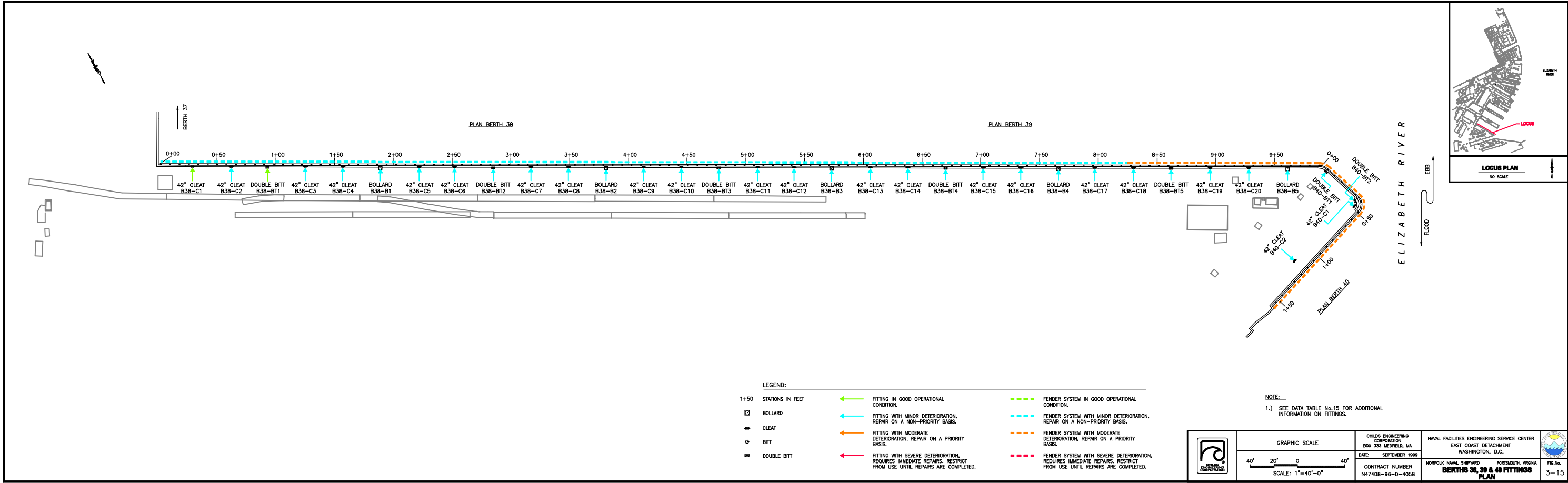
FIG.No. 3-12

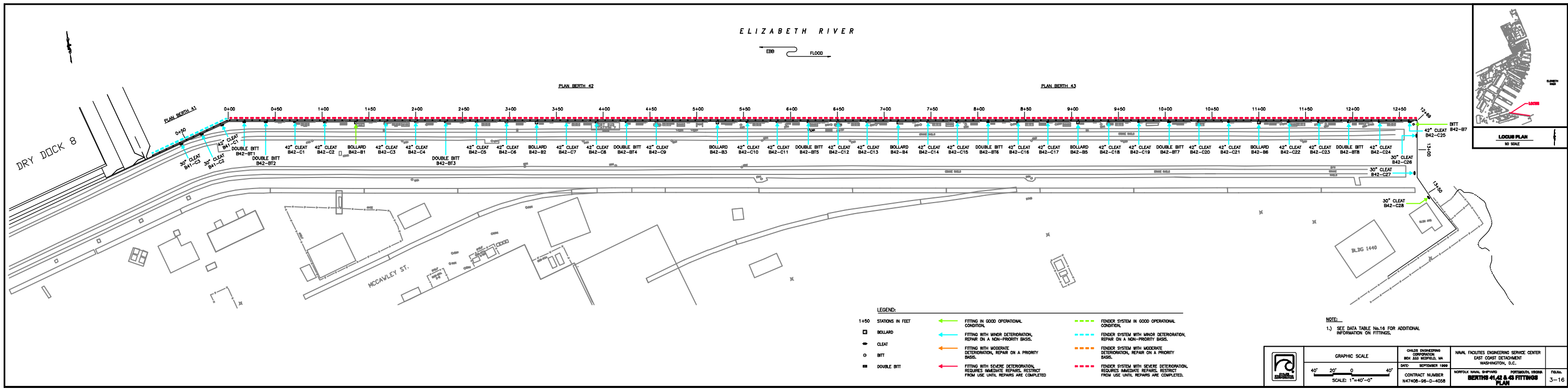


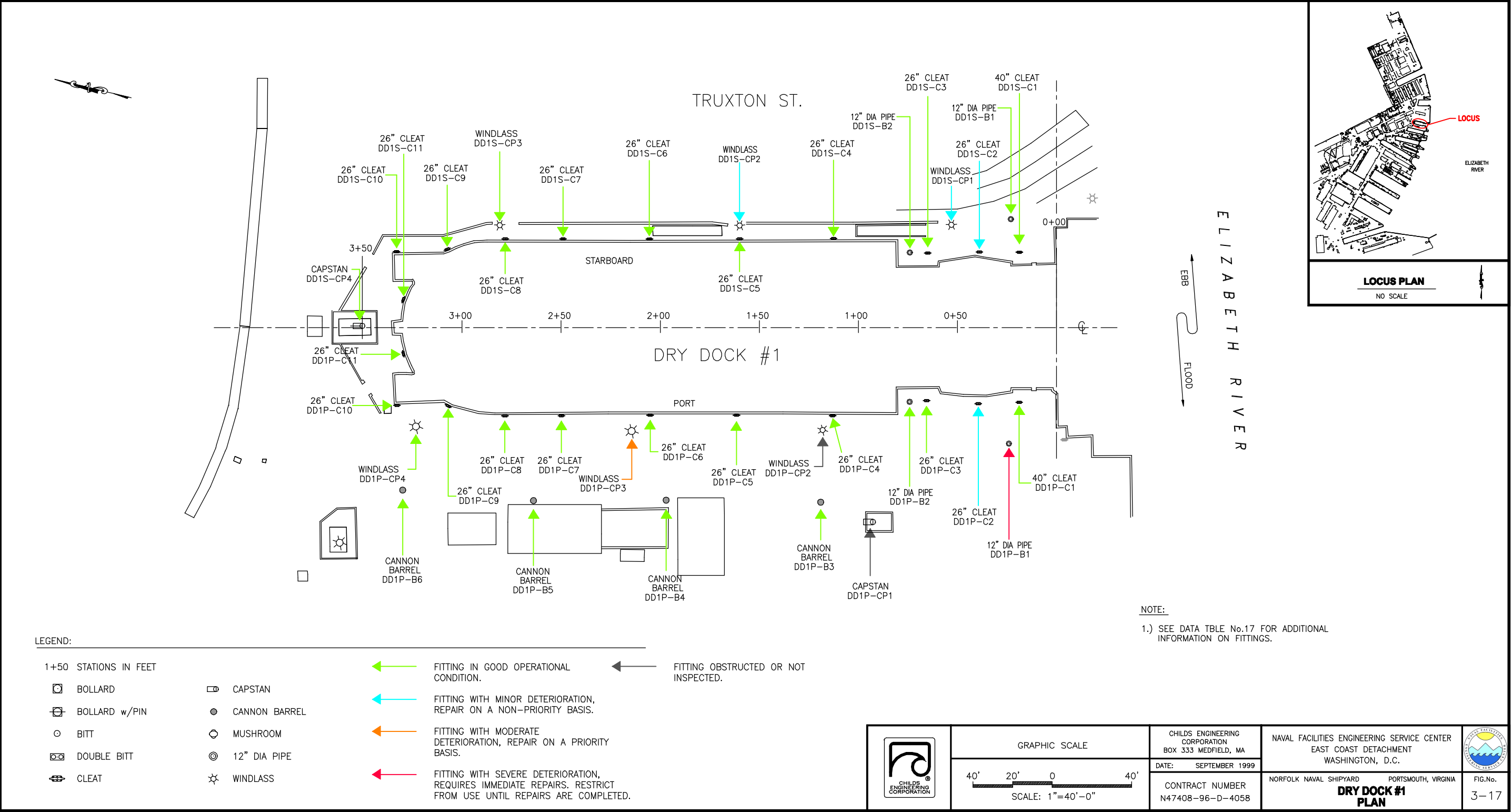


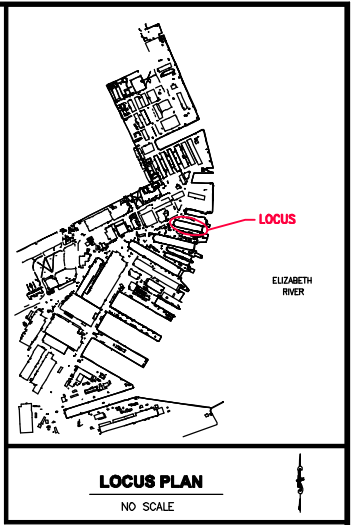
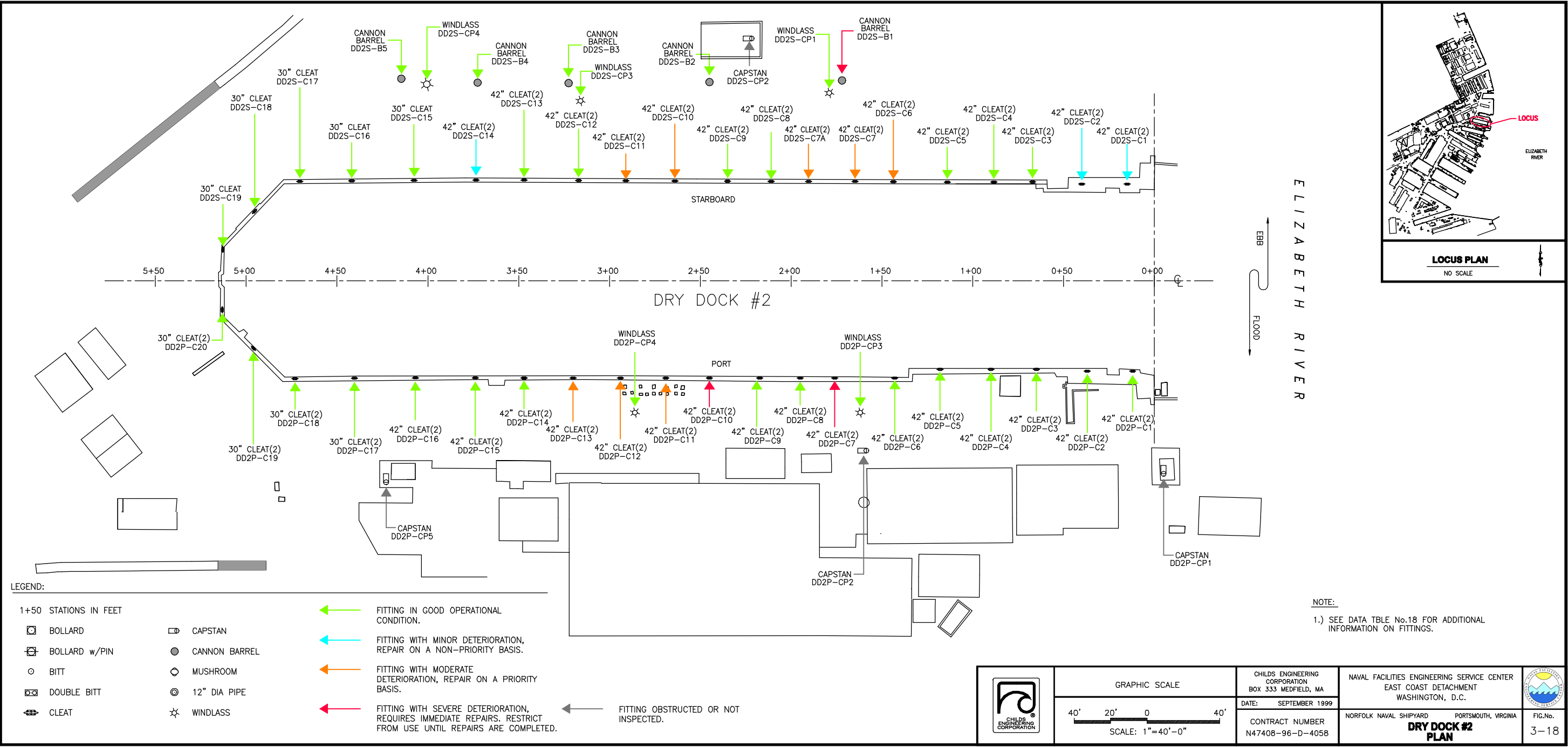
LOCUS PLAN

NO SCALE









ELIZABETH RIVER

EBB
FLOOD

DRY DOCK #2

STARBOARD

PORT

LEGEND:


1+50 STATIONS IN FEET

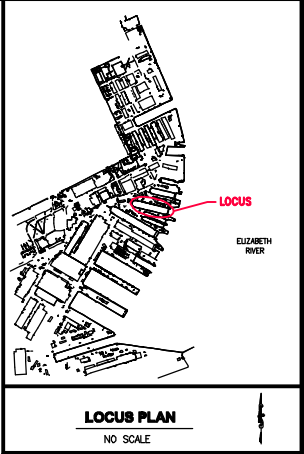
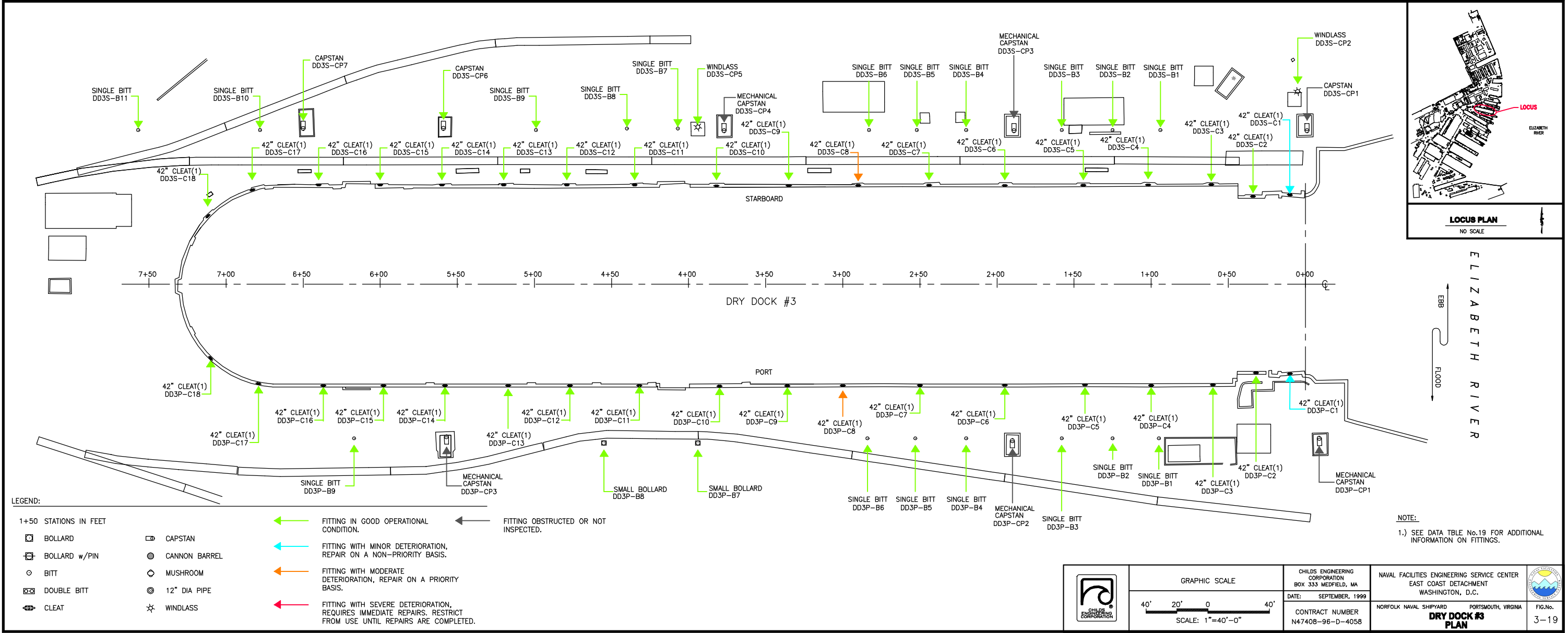
- BOLLARD
- BOLLARD w/PIN
- BITT
- DOUBLE BITT
- CLEAT
- CAPSTAN
- CANNON BARREL
- MUSHROOM
- 12" DIA PIPE
- WINDLASS

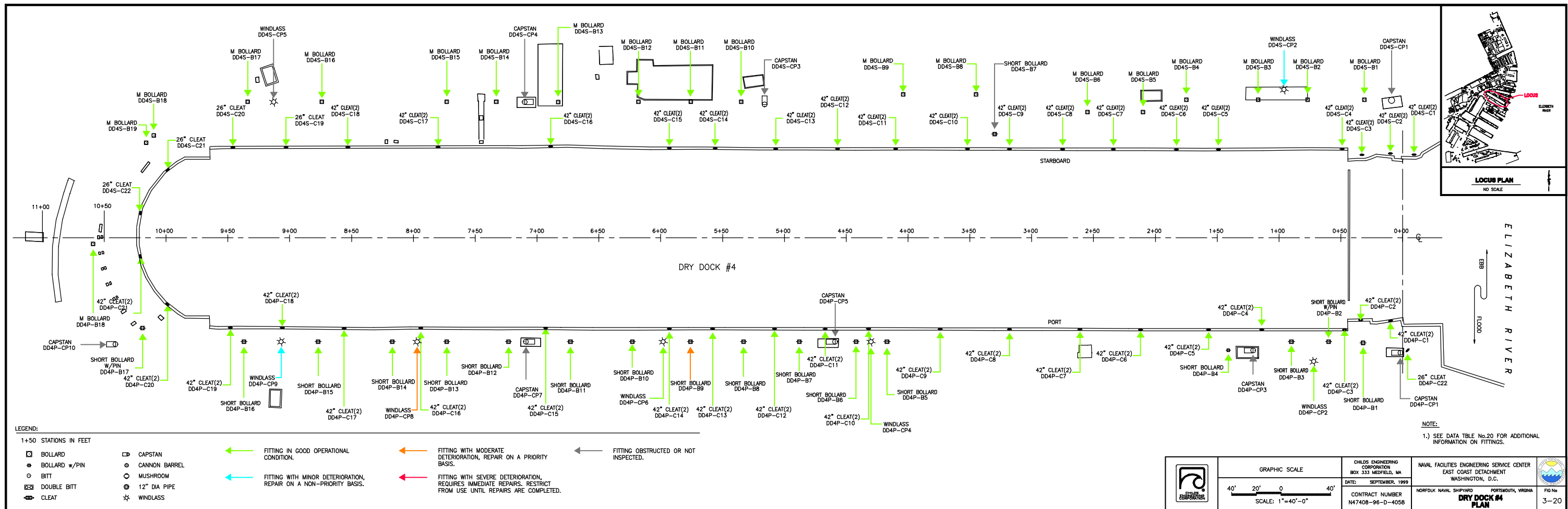
- FITTING IN GOOD OPERATIONAL CONDITION.
- FITTING WITH MINOR DETERIORATION, REPAIR ON A NON-PRIORITY BASIS.
- FITTING WITH MODERATE DETERIORATION, REPAIR ON A PRIORITY BASIS.
- FITTING WITH SEVERE DETERIORATION, REQUIRES IMMEDIATE REPAIRS. RESTRICT FROM USE UNTIL REPAIRS ARE COMPLETED.
- FITTING OBSTRUCTED OR NOT INSPECTED.

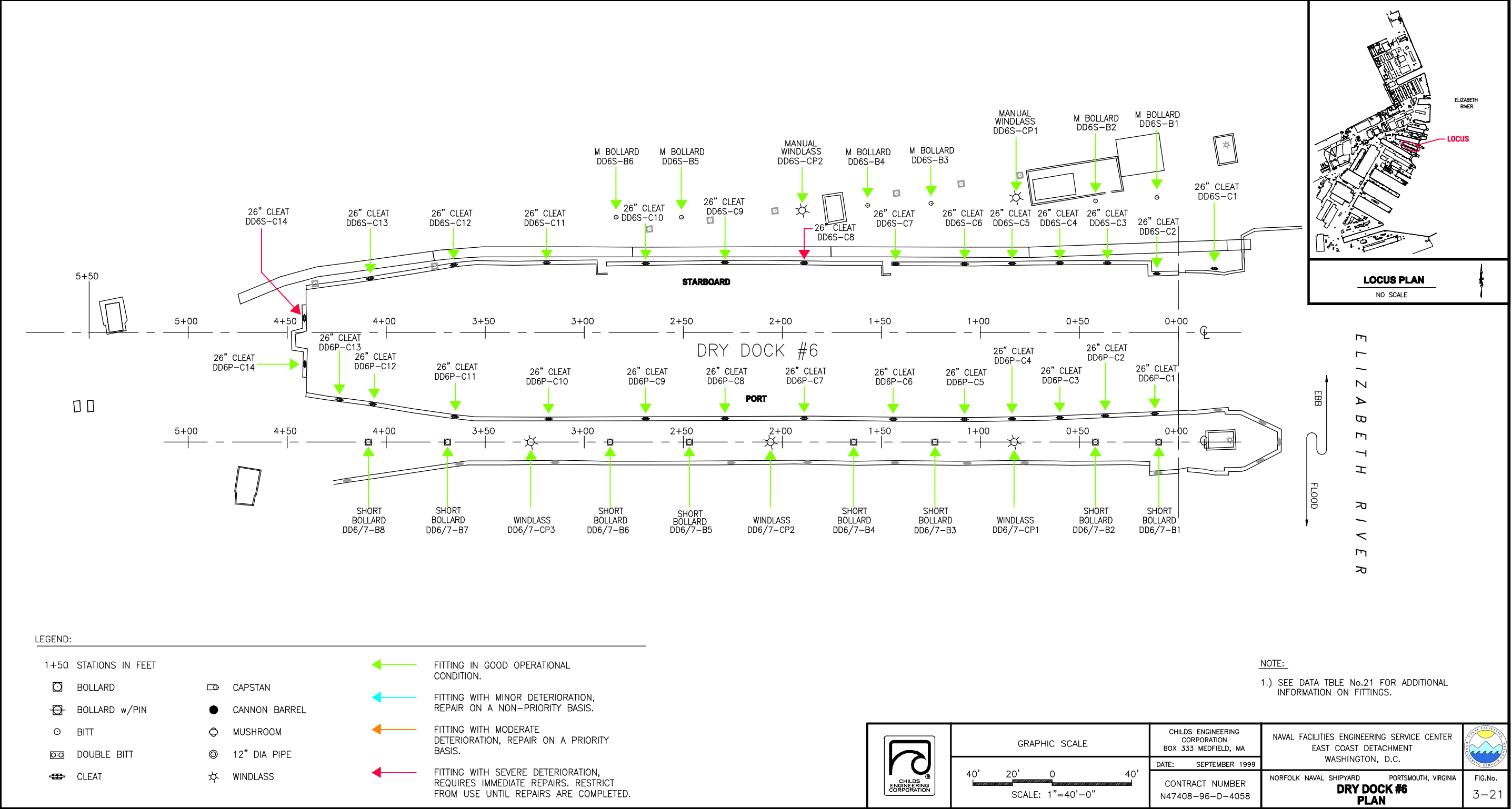
NOTE:

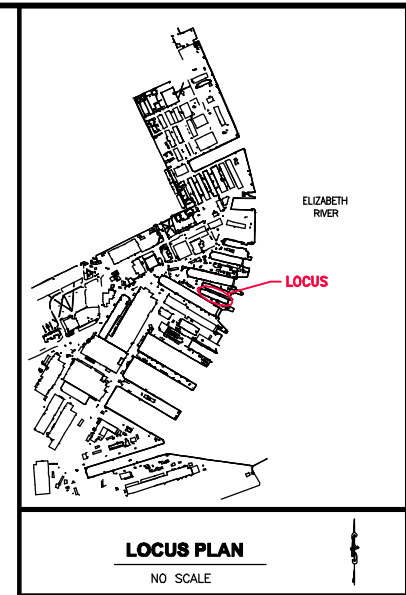
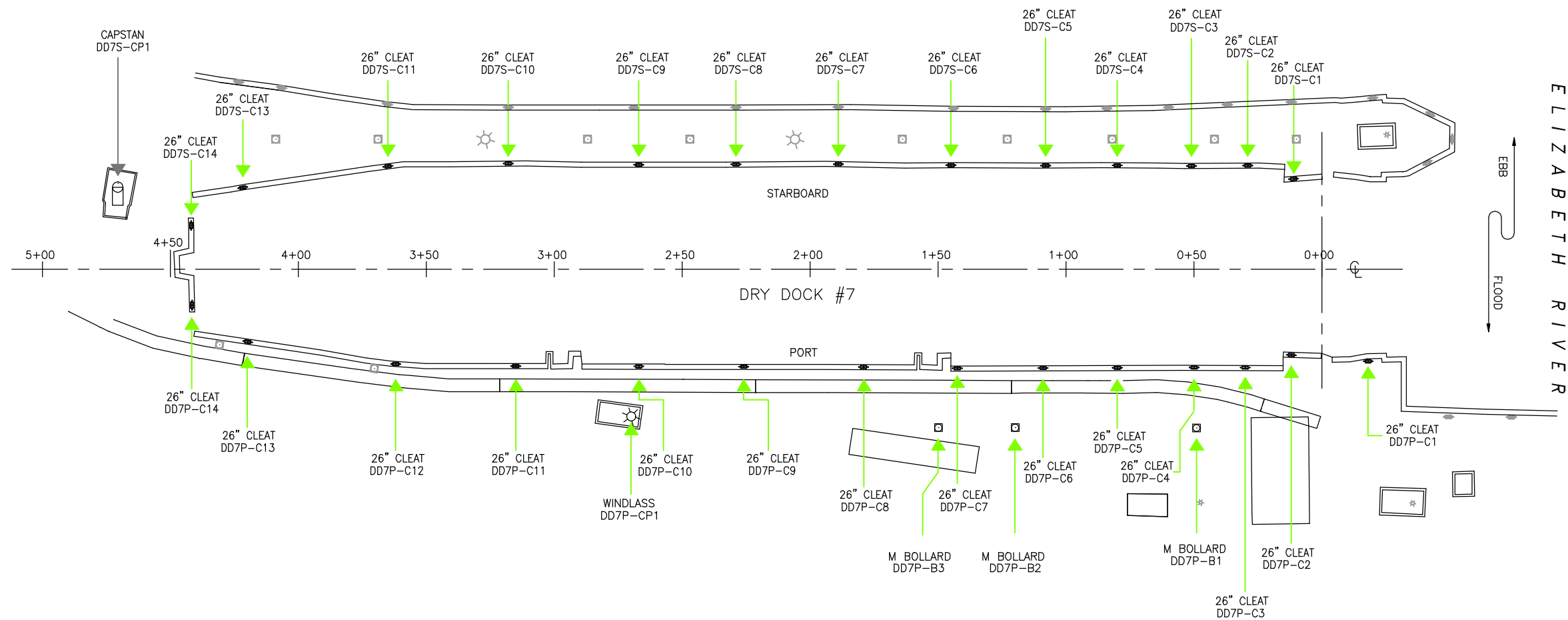
1.) SEE DATA TBL No.18 FOR ADDITIONAL INFORMATION ON FITTINGS.

 CHILDS ENGINEERING CORPORATION	GRAPHIC SCALE 40' 20' 0 40' SCALE: 1"=40'-0"		CHILDS ENGINEERING CORPORATION BOX 333 MEDFIELD, MA DATE: SEPTEMBER 1999	NAVAL FACILITIES ENGINEERING SERVICE CENTER EAST COAST DETACHMENT WASHINGTON, D.C. NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA DRY DOCK #2 PLAN	 FIG.No. 3-18
			CONTRACT NUMBER N47408-96-D-4058		









LEGEND:

1+50 STATIONS IN FEET

- BOLLARD
- BOLLARD w/PIN
- BITT
- DOUBLE BITT
- CLEAT

- CAPSTAN
- CANNON BARREL
- MUSHROOM
- 12" DIA PIPE
- WINDLASS

- FITTING IN GOOD OPERATIONAL CONDITION.
- FITTING WITH MINOR DETERIORATION, REPAIR ON A NON-PRIORITY BASIS.
- FITTING WITH MODERATE DETERIORATION, REPAIR ON A PRIORITY BASIS.
- FITTING WITH SEVERE DETERIORATION, REQUIRES IMMEDIATE REPAIRS. RESTRICT FROM USE UNTIL REPAIRS ARE COMPLETED.

FITTING OBSTRUCTED OR NOT INSPECTED.

NOTE:

- 1.) SEE DATA TBLE No.21 FOR ADDITIONAL INFORMATION ON FITTINGS.

	GRAPHIC SCALE		CHILDS ENGINEERING CORPORATION BOX 333 MEDFIELD, MA	NAVAL FACILITIES ENGINEERING SERVICE CENTER EAST COAST DETACHMENT WASHINGTON, D.C.	
	 SCALE: 1"=40'-0"		DATE: SEPTEMBER 1999		
			CONTRACT NUMBER N47408-96-D-4058	NORFOLK NAVAL SHIPYARD PORTSMOUTH, VIRGINIA DRY DOCK #7 PLAN	FIG.No. 3-22

